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HOW SHALL THIS EVIL BE PREVENTED?

It appears from a report made to Congress upon our commerce and navigation, by the late Secretary of the Treasury, that of 1300 steamboats built in the United States, *two hundred and sixty* have been lost by accident.

This is a startling statement;—one-fifth of the whole number of vessels destroyed; and with them have perished thousands of human beings: the mind recoils from it with horror. For the sacrifice of a few lives to religious or political zeal, crusades have been preached and armies banded; while here, year after year, hundreds of victims are immolated, and it scarcely excites a passing emotion. We make no effort to prevent a recurrence of these accidents, nor to guard against their fatal consequences. We have not acquired even the wisdom of caution from the lessons they teach. Ordinary care would have prevented some of the direst calamities recorded in the history of steam; but with success in the use of this agent, it would seem we have grown less guarded. The loss of the steamboat Erie, with the melancholy circumstances that attended her destruction, is such an event as might have been predicted by any one possessing ordinary forecast, who has watched the progress of steam navigation in this country. When the burning of the Lexington, styled as it was, and justly so, 'a national calamity'—thrice

horrible from its occurring in mid winter—produced nothing more than a mockery of reform in providing such protective appliances as were then seen to be necessary, could we dare to hope that less than the same fearful loss of life would result from a like casualty?

As a people, we have felt a laudable ambition to perfect an invention that had its birth with us; but keeping the end only in view, we have too little regarded the more important consideration of safety. We have desired to outstrip the world in speed, and perhaps we have done so, but 'the virtue has proved a traitor to us.' The sacrifices to this Moloch of our vanity have, by their frequency, become stript of the frightful character they should bear: we are familiarized to them as men are to death who live in a plague-city, until our indifference has become a byword and a reproach.

It is not our purpose here, however, to animadvert upon the evil: we simply desire to set forth the means that ingenuity and skill have devised for its correction, and enforce the best we can the necessity for their speedy adoption. The first and principal remedy is the substitution of iron for wood in building the hull, paddle boxes, and the many other parts of steam vessels that can with advantage, in point of lightness and strength, be made of the first named material. Those parts that must necessarily be made of wood, should, wherever practicable, be covered with sheets of copper, iron, or some other suitable metal. A fire-engine, of power sufficient to throw any desirable quantity of water to the farthest extremity of the boat, should be attached to the steam machinery, and so adjusted that but an instant would be required to put it in full operation. Among the several engines of this kind that have come under our notice, we have not seen a better than that of the Messrs. Serrell, a description of which will be found in the proceedings of the Mechanics' Institute for 1840, published in this journal.*

It is apparent that a boat thus built and protected might defy the perils of snagging, stranding, fire, collision with another vessel, and nearly every other hazard that endangers life except an explosion, and in many cases it would render the conse-

* See Report of the Committee on Arts and Sciences, Repertory for March, 1840.

quences of even the last less fatal. The remedy addresses itself to our interests as well as feelings. All experience with iron ships has shown that they possess many advantages over those of wood, apart from safety: they draw less water, when of the same tonnage; are, from their pliancy, better sailers; and are eventually much cheaper, owing to their greater durability.

But our efforts should not stop short of any degree of safety it is possible to attain. Life-boats, life-preservers, and such auxiliaries as are indispensable in an ordinary vessel, should be deemed equally so in an iron boat. The liability of the latter to accidents, although much diminished, is not wholly removed; a catastrophe may be merely delayed, not prevented; but time is given to put in requisition such helps as may be within reach, and a few moments are often of the utmost value. There were life-preservers enough on board the Erie to have saved half of the persons who perished with her; but the destruction of the boat was too rapid to permit of their being used. Self-possession is a quality that should be cultivated: it has proved the savior of hundreds in like perils; a settee, or stick of wood even, opportunely thrown to one struggling in the water, would often prevent drowning. We met recently with an invention for stuffing the bottoms of steamboat chairs and settees with cork shavings; and it has been suggested that pieces of cork be attached to the under side of all the movable seats on board of steamboats: both are worthy of consideration. Settees of poplar and white pine are very buoyant in themselves, and it would be well if they were universally made to displace the worse than comfortless cane-bottom seats: we can afford to sacrifice appearances to safety.

The notice we have taken of explosions, the cause of so large a proportion of deaths by steamboat accidents, is but a passing one. We desired not to endanger the adoption of those preventives, about which there cannot be a difference of opinion, by mingling them with a debatable subject. Let us hope that this only remaining cause of dread will ere long be as surely and as easily under our control.

For the American Repertory.

ON THE PROPERTIES OF NUMBERS.

BY J. A. POWERS.

My leisure hours have been devoted for several years to investigating the properties of numbers; more particularly, however, the laws which govern numbers in respect to the number of their divisors. The accompanying article contains a brief abstract of the results; and although they may at first seem calculated only for mathematical amusement, a more critical examination will show that they furnish data for the solution of problems, which, independent of their aid, it would be quite impossible to solve.

A toy in one age is a wonder in the succeeding; and perhaps it may not be hazarding too much to anticipate that the following laws will lead to results which will furnish data for performing the most rigid arithmetical operations, such as involution, evotion, &c. mentally. When we see the astonishing facility with which, by their application, operations can be performed involving billions of billions of divisions, of ten thousand times ten thousand multiplications of numbers, so vastly immense that millions of millions of ages would be requisite even to numerate, surely this anticipation cannot be considered visionary.

If we take the series of numbers, $\overset{1}{1}, \overset{2}{2}, \overset{2}{3}, \overset{3}{4}, \overset{2}{5}, \overset{4}{6}, \overset{2}{7}, \overset{4}{8}, \overset{3}{9}, \overset{4}{10}, \overset{2}{11}, \overset{6}{12}, \overset{2}{13}, \overset{4}{14}, \overset{4}{15}, \overset{5}{16}, \overset{2}{17}, \overset{6}{18}, \overset{2}{19}, \overset{6}{20}, \overset{4}{21}, \overset{4}{22}, \overset{2}{23}$, &c. continued indefinitely, and put over each the number of its divisors, we shall obtain a second series, 1, 2, 2, 3, 2, 4, 2, &c. in which we shall be unable to trace any regular order. The succeeding terms are sometimes greater, and sometimes less; accordingly, they do not seem to follow any fixed law, either in respect to themselves or in respect to their corresponding terms in the first series. These remarks are general, and equally applicable to all arithmetical progressions, since they are produced by the addition or subtraction of some equal number. If, on the other hand, we take any geometrical series, $\overset{1}{1}, \overset{2}{2}, \overset{3}{4}, \overset{4}{8}, \overset{5}{16}, \overset{6}{32}, \overset{7}{64}$, &c. and put over each term the number of its divisors, we shall

obtain a second series 1, 2, 3, 4, 5, 6, 7, &c. which, it will be readily perceived, is produced by the continual addition of unity.

As this one example is hardly sufficient to establish the general principle, I prefix the following table, in which the columns A, B, C, express the first term, ratio and increment by which the numbers in the second series are produced respectively.

A	B	C	A	B	C	A	B	C	A	B	C
2	2	1	4	4	3	6	6	4	8	8	5
3	2	2	5	4	4	7	6	4	9	8	7
4	2	1	6	4	4	8	6	6	10	8	6
5	2	2	7	4	4	9	6	3	2	9	4
6	2	2	8	4	2	10	6	6	3	9	2
7	2	2	9	4	5	2	7	2	4	9	5
8	2	1	10	4	4	3	7	2	5	9	4
9	2	3	2	5	2	4	7	3	6	9	2
10	2	2	3	5	2	5	7	2	7	9	4
2	3	2	4	5	3	6	7	2	8	9	6
3	3	1	5	5	1	7	7	1	9	9	2
4	3	3	6	5	2	8	7	4	10	9	4
5	3	2	7	5	2	9	7	3	2	10	4
6	3	2	8	5	4	10	7	4	3	10	4
7	3	2	9	5	3	2	8	3	4	10	5
8	3	4	10	5	2	3	8	6	5	10	4
9	3	1	2	6	4	4	8	3	6	10	6
10	3	2	3	6	4	5	8	6	7	10	6
2	4	2	4	6	5	6	8	6	8	10	6
3	4	4	5	6	4	7	8	6	9	10	5

The use of the foregoing table is obvious. For example:—Suppose it were required to determine the number of divisors corresponding to each term in the series 7, 14, 28, 56. The first term being 7, and ratio 2, I look in the table till against 7, in column A, I find 2 in column B, against which in column C I find the increment 2, by the addition of which the required numbers are to be determined. Now 7 is divisible by two divisors: consequently 14 is divisible by $2+2$ divisors, 28 by $2+(2\times2)$ divisors, and 56 by $2+(2\times3)$ divisors. In the same manner the calculation might be extended to any other term, and the result obtained much more readily than the corresponding term. Suppose, for example, it were required to determine the number of divisors answering to the 79,424th term: by the

foregoing principles, $(79,424-1\times2)+2=158,848$, the number required. Hence (from analogy) it is inferred, that if a series of numbers increase by a continual multiplication of some equal number, the number of their divisors will increase by the continual addition of some equal number. Hence, by having the first term and ratio, together with the number of their divisors given, the number of divisors corresponding to any term in the series, however remote, can be determined, since the increment or number to be added is equivalent to the difference between the number of divisors corresponding to the first and second terms.

We will now proceed briefly to investigate some of the laws which govern powers, and show the method of deducing data for calculating the number of their divisors.

The first power of any abstract number $a=a$, the second $=aa$, the third $=aaa$, the fourth $=aaaa$. If we arrange these powers according to their order, we shall have a, aa, aaa, $aaaa$, which, it will readily be perceived, constitute a geometrical series in which the first term and ratio are equivalents: hence if one be given the other is also given.

Hence also, by the foregoing principles, the first and second powers, together with the number of their divisors, constitute data for determining the number of divisors corresponding to any other power. For example, let it be required to determine the number of divisors answering to the 243,456th power of 6? *Solution:* The given number 6 has 4 divisors; its second power 36 has 9 divisors; hence, by the foregoing, $(243,456-1)\times(9-4)+4=1,217,279$, the number required.

Example II. Prob.—To determine the number of divisors the 24,526th power of 8 is divisible by? *Solution:*—The first and second powers of the given number are divisible by 4 and 7 divisors respectively; therefore, $(24,526-1)\times(7-4)+4=73,579$, the number required.

Example III. Problem.—To determine what power of 2 is divisible by 29,280 divisors? *Solution.*—The first and second powers of 2 are divisible by 2 and 3 divisors respectively; hence, $\frac{29,280-2}{3-2}+1=29,279$, the index of the required power.

These principles are universally applicable to all except decimal numbers. Farther investigation, however, will show that beside the above, different species of numbers are governed by laws peculiar to themselves. Thus it is a law that the number of divisors corresponding to the n^{th} power of any prime number a, is equivalent to the number of divisors corresponding to the n^{th} power of any prime number b; the reason of which is evident, since their respective roots or first powers have an equal number of divisors.

It is another law of prime numbers that the number of divisors corresponding to the n^{th} power of any prime number a, is equivalent to the index of the power + unity. This will be made evident when we consider that the first power is divisible only by itself and unity; the second power, by itself, unity, and the first power; the third power, by itself, unity, the first and second powers; the fourth power, by itself, unity, the first, second, and third powers; and so on *ad infinitum*.

Another law of prime numbers is, that the number of divisors corresponding to the product of any number of different prime numbers is equivalent to double the number of factors.

It is a law of decimal numbers 1, 10, 100, 1000, &c. that the number of their divisors is equivalent to the square of the number of symbols of which the number is composed. Thus 10 is composed of two symbols; it is therefore divisible by $2^2=4$ divisors. In the same manner 100 is divisible by 3^2, 1000 by 4^2, 10000 by 5^2 divisors.

Application of the foregoing Laws to the solution of several Problems.

Problem I.—The first term of a geometrical series is 20, and ratio 4; from this data to determine the number of divisors corresponding to the 50,000,000th term?

Solution.—The first term 20 has 6 divisors, the second term 80 has 10; hence, $(50{,}000{,}000-1)\times(10-6)+6=200{,}000{,}002$, the number required.

Problem II.—To determine the number of divisors corresponding to the 426,780th power of 6?

Solution.—The first power is divisible by 4 divisors, the se-

cond power by 9 ; hence, $(426,780-1)\times(9-4)+4=2,133,899$, the number required.

Problem III.—To determine what power of 4 is divisible by 4843 divisors ?

Solution.—The first and second powers are divisible by 3 and 5 divisors respectively ; hence, $\frac{4845-3}{5-3}+1=2421$, the index of the required power.

Problem IV.—To determine the number of divisors corresponding to the 520th power of 7 ?

Solution.—Seven is a prime number ; hence, $520+1=521$, the number of divisors required.

Problem V.—To determine what power of 11 is divisible by 2456 divisors ?

Solution.—Eleven is a prime number ; hence, $2456-1=2455$, the index of the required power.

Problem VI.—To determine the number of divisors corresponding to the product of any fifty prime numbers, provided they are all different ?

Solution.—$50\times2=100$, the number required.

Problem VII.—To determine the number of divisors corresponding to a certain decimal number composed of a unit and 42,652,000 cyphers ?

Solution.—$(42,652,000+1)^2=1819193189304001$, the number required.

Problem VIII.—To determine what decimal number is divisible by 400 divisors ?

Solution.—$\sqrt{400}=20$, and $20-1=19$; therefore the required number is composed of a unit and 19 cyphers.

Problem IX.—Estimating the earth's surface at 200,000,000 square miles, and supposing it to be covered with cyphers each occupying $\frac{1}{10}$ of a square inch, and that this vast amount of cyphers in connection with a unit constitute one entire number, to determine the number of its divisors ?

Solution.—Expression of symbols : let a = the number of cyphers, and z the number of divisors required ; then by the rules of arithmetic, $(63360)^2\times200000000\times10^2=a=80289792000000$-$000000$, and by one of the foregoing laws $(a+1)^2=z=644645$-$0699403260000160579584000000000001$.

Problem X.—Estimating the dimensions of the earth as before, and supposing its entire surface to be covered with 3s $\frac{1}{10}$ of an inch square, and supposing them to be multiplied into each other continually, to determine the number of divisors corresponding to the last result?

Solution.—Expression of symbols: let $a=$ the number of 3s, and z the number of divisors required; the value of a in this case is equivalent to the value of a in the solution of Prob. IX, and by one of the foregoing laws, $a+1=z=80289792000000$-00001.

LIME, AND ITS COMPOUNDS.

[CONTINUED FROM PAGE 5.]

We pass over the various modifications by which the lime kiln has gradually been brought from the rude forms before described to its present improved state, and come at once to speak of the kind of kiln that combines the greatest number of advantages.

Rüdesdorf, near the city of Berlin, in Prussia, is celebrated for the manufacture of lime, both for the quantity annually produced, and for the degree of perfection to which the process has been brought. The number of experiments, with their results, that have been there undertaken, afford a mass of valuable information that we might, perhaps, look elsewhere for in vain. Kilns of various forms are used, differing in principle as well as construction. We shall describe the kind which has been found, comparatively with the others, to produce the best results. It is of the class known as *perpetual* or *draw kilns;* so called because the burning may be continued without intermission as long as the structure lasts, the calcined products being raked out at distinct openings arranged so as not to interfere with the continuous action of the fire.

The kiln here represented has five fire-chambers and ashpits, and five openings for withdrawing the lime. The interior part, or calcining chamber as we shall call it, is in the form of a spindle truncated at both ends, the curve having a radius of about four times the greatest width of the chamber. This form

is preferred, as it facilitates the calcination of the limestones in the upper part of the charge, by reverberating the heat upon them. Fig. 1 presents a view of the kiln divided vertically through the centre of the fire-grate, in the direction indicated by a dotted line in Fig. 2. The interior wall *a a* is formed of

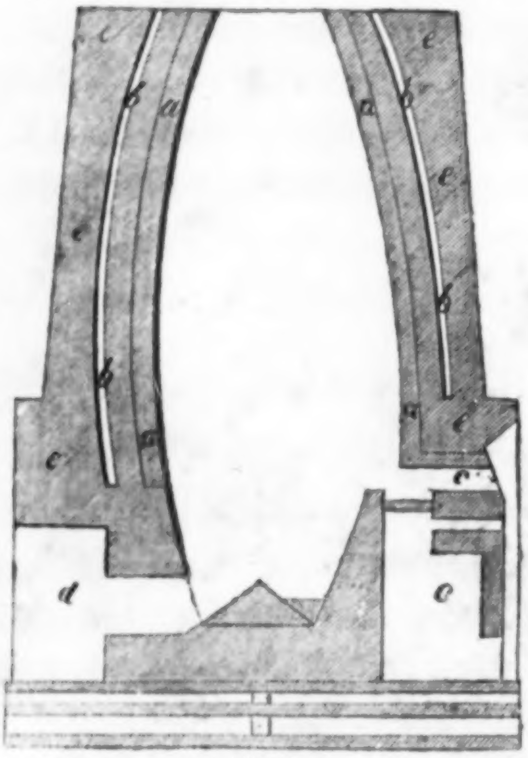
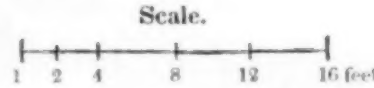


Fig. 1.



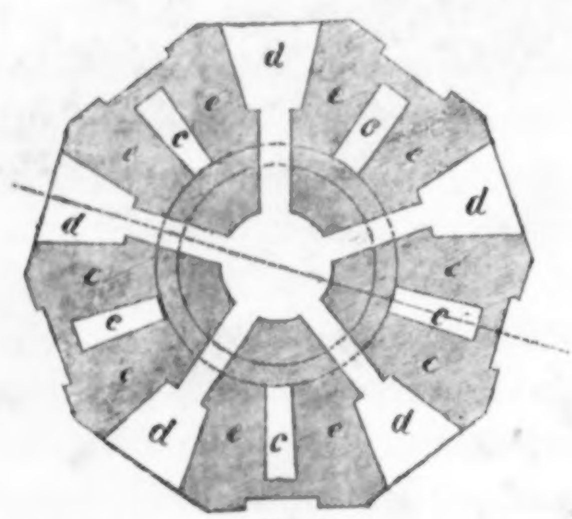


Fig. 2.

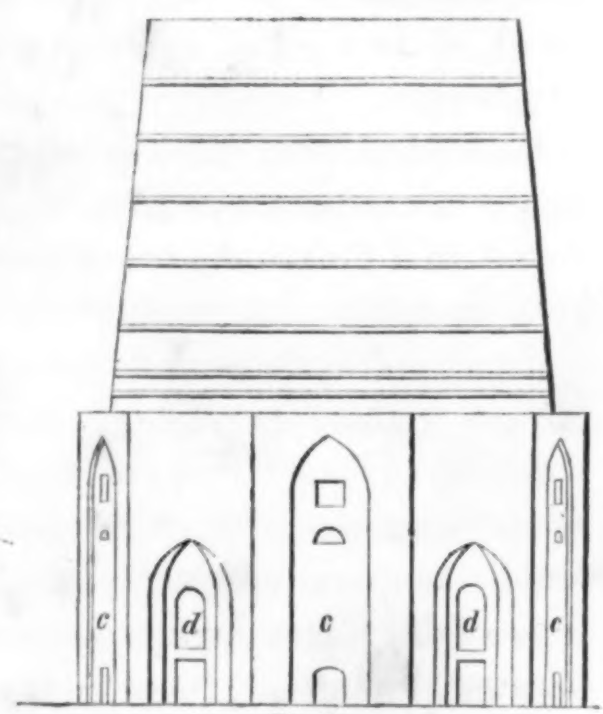


Fig. 3.

fire-bricks: adjoining this is a wall of common bricks, between which and the outside wall *e e*, of masonry in rough stone, is a space *b b* filled with ashes, to allow the inner walls to expand by heat without injuring the whole structure. The letters *c c* show the fire-chamber, ashpit, and channel for supplying the fire with air: *d* is the opening at which the lime is raked out. The fire-chamber is arched above, and lined with fire tiles to

protect it from the destructive action of the heat: the grate is also formed with fire tiles, each having three or four slits an inch wide, for admitting air to the fire.

Fig. 2 is a horizontal section of the kiln, and represents the relative positions of the fire-chambers, discharging apertures, &c; the concentric circles show the mean and extreme diameters of the calcining chamber, and its diameter at the level of the fire grate.

Fig. 3 is an elevation: the forms and dimensions of the several openings to the kiln, all of which should be provided with iron doors, are here shown. The doors to the discharging outlets are opened only to remove the lime: during the burning they are carefully luted with loam. Kilns of this description should be built against the face of a cliff, so that easy access may be gained to the mouth for charging them, by making a sloping cart-road to the top of the bank. The mouth or upper opening should be surrounded by a strong iron balustrade, to guard against the chance of the workmen falling in.

When the kiln is completed, it must be left to dry spontaneously for several days: a little fire is then lighted, which should be increased very gradually, so that the shrinking of the mortar may take place without causing large fissures, which would occur if it were dried too rapidly. The calcining process is commenced by filling the kiln with limestones to the level of the grate; a fire of wood is built in *d*, and continued until the mass is converted into quicklime. Fresh portions of limestone are next introduced at the mouth, which should be let down in buckets rather than thrown in, until the kiln is entirely filled; while over the top a cone of limestones is piled up about four feet high. The fire is now wholly removed to the chamber *c*, and from this time the process goes on uninterruptedly. The products of the kiln are removed successively at *d*, (care being had that no part of a charge not perfectly calcined is suffered to fall below the level of the grate) the mass above falls, the kiln is re-supplied, and fresh limestones piled up as before.

It has been found that limestone is more easily calcined when fresh from the quarry than after it has lain awhile exposed to the air. This effect, which is due to the humid condition of the

newly extracted stone, is analogous to that observed in many other processes for the liberation of volatile matters: the water, by its conversion into vapor, favors the disengagement of carbonic acid gas. It is a matter of economy to use moist limestone, notwithstanding the great degree of heat required to drive off the moisture: many lime burners are aware of this, and they wet the limestones, if it be necessary, before charging the kiln with them. The lime is proportionably better as the stone employed is more dense. The duration of the process is not always the same: it varies according to the quality and kind of fuel, and the hardness of the limestone used. It depends also upon the temperature and hygrometrical state of the atmosphere: a light wind and damp air are favorable to calcination, while storms, rain and high winds will very often retard it to a degree almost fatal to the success of the operation.

The kiln we have described is usually discharged twice in 24 hours, yielding each time about 150 bushels of lime, or 300 bushels per day.* The fuel used is a mixture of wood and turf, in the proportion of 1 part of the former to 4 of the latter by measure. In the best constructed perpetual kilns, the values of wood, peat, and bituminous coal have been found to be as follows:—

1 cord of best wood	will burn	110	bushels	lime.†
1 " " peat	" "	70	"	"
1 bushel coals	" "	$4\frac{1}{2}$	"	"

Lime kilns are sometimes surrounded by an additional wall, leaving a space for galleries or chambers in which the fuel and quicklime are stored to keep them dry. Dr. Ure‡ describes a three-fold kiln, (so called from the number of its fire-doors, that which we have described being five-fold) in use at Rüdersdorf, that has, beside the several stories of rooms for receiving the

* Whenever the term bushel is used, it refers to the Winchester bushel—the standard of dry measure in the United States.

† We have here given the largest result obtained with wood: many experiments with woods of inferior quality gave much smaller returns, being as low in some instances as 75 bushels to the cord. Faggots or brushwood will not yield more than 40 bushels to the cord.

‡ Ure's Dictionary of Arts, Manufactures, &c. London, 1839.

lime and fuel, extensive ranges of apartments and sleeping rooms for the workmen.

The kiln to which we have devoted so large a space, although superior to all others, may not, in some situations, be preferable to one of a simpler kind. We shall therefore conclude this part of the subject by describing two other forms of kiln, at present much in use, and possessing several advantages over the ordinary conical kiln.

A few years since, the *Société d'Encouragement*, in France, offered a considerable prize as a reward to the inventor of the best form of lime kiln, in operation, that should be submitted to them. The following is a description of the kiln for which the prize was awarded :—

The structure, externally, is a pyramid 21 feet long, and 16 feet wide at the base, and 19 feet high : the centre of the shaft is about 7 feet from one end, leaving a space between the fire door and the farther end for a capacious recess, in which the lime is deposited and kept dry as it is drawn from the furnace.

The walls of the shaft are, as usual, of fire-bricks : the outer walls are of solid masonry in hewn stone.

The grate is circular, and composed of movable bars of iron lying in notches in the edge of an iron ring; the whole resting upon a ledge of brick work, and being supported in the centre by a transverse bar let into the walls. At the height of a few inches above the grate, the brick work forms a second ledge, upon which a spheroidal arch of limestones is built to support the furnace charge.

The calcining chamber, or main body of the shaft, for nearly its whole height, is of an elliptical form, somewhat resembling an egg truncated at both ends: at a short distance below the mouth it becomes cylindrical.

The following measurements, taken from a drawing of the kiln, will farther assist in conveying an accurate knowledge of its construction :—

	Feet.	In.
Thickness of mason work in stone beneath the walls of the shaft	1	6
Height from floor of ashpit to grate	2	4

Height of ledge upon which the charge rests	0	9
Height of elliptical part of calcining chamber..........	12	9
Height of cylindrical part of calcining chamber	1	8
Diameter of ashpit	4	3
Diameter of grate	4	10
Diameter of calcining chamber at its base	6	7
Greatest diameter of calcining chamber	7	10
Diameter of cylindrical part of calcining chamber.....	2	5
Width of fire-door	1	10

In charging the kiln, the limestones are first disposed in the form of a hemisphere, and resting upon the projecting ledge at the bottom of the calcining chamber, which we have before described; the largest pieces are selected for this purpose, and so arranged as to leave the greatest possible interstices for the passage of the flame. Such an arch is most easily constructed by forming it of separate chains of large stones, wedges being put between these chains to maintain them at the distance of two or three inches apart. The arch being completed, the limestones are thrown in without arrangement, except to keep the largest pieces in the centre, until the kiln is full. A slow fire is now lighted upon the grate, and maintained with but little increase of intensity for ten or twelve hours; during this time the smoke blackens the stones, and goes out in dense volumes at the top of the kiln: this part of the operation is technically called *smoking*, and it is done to give the mass time to become heated before the flame comes in contact with it. If these precautions were not taken, the stones of the arch would be too quickly calcined, in which case there is danger that they would give way and suffer the whole charge to sink down.

When the smoking has been sufficiently prolonged, the fire is gradually augmented until the mass becomes of nearly a white heat for about one-third of its height: at this point, the rapid expansion of the air in the upper part is apt to cause a reäction, and force the flame out at the door if it is not kept carefully shut.* From this time it is necessary to support the fire steadily, and take great care that a partial coldness does

* This phenomenon is sometimes observable in the perpetual kilns.

not happen within the kiln: if, for example, a current of cold air should blacken the stones already glowing, the success of the operation would be very much endangered.

The flame gains gradually to the upper part, and at last makes its way out at the top of the kiln nearly free from smoke. The calcination is now nearly complete, and the fire should be gradually diminished to the end of the operation: after the fire is quite extinguished, the stones are left to cool for six or eight hours, and the charge is then withdrawn.

In many parts of France, Belgium, and England, perpetual kilns of the following description are used, which appear to be better suited than either of the others we have described for burning anthracite, although those might easily be modified to adapt them to the use of that fuel:

The principal novelty in the construction of this last kiln is its calcining chamber, which is in the form of an *inverted* truncated cone. The fire chamber, ashpit, &c. do not differ essentially from those of the elliptical furnace just described. The grate, like the former, is of movable bars of iron, resting on the brick work in the rear, and in front upon a transverse bar of iron let in the masonry. The calcining chamber is of about the following proportions: say 2 feet diameter at the fire chamber, 11 feet diameter at the top, and 14 feet high.

The kiln is charged with alternate beds of limestone and fuel, in the proportion of 4 parts of limestone by measure to 1 part of coal or 1·5 of coke: these quantities, from the nature of the limestone and the quality of the fuel, often vary. When all the mass is once well heated, by the aid of a fire lighted at the bottom of the kiln and gradually increased, the fuel intermingled with the limestone lights by degrees, and calcines the stones resting upon it. When the operation is sufficiently advanced, which may be known by the usual tests, two-thirds of the charge is withdrawn, and a corresponding quantity is again thrown in at the top in alternate beds of limestones and fuel. In this manner lime may be withdrawn, and fresh materials added, until the kiln needs repair. When the grate is removed to let the calcined lime fall, air is supplied for combustion, by channels leading to the sides of the fire chamber; each channel

is protected by a vertical grate from being clogged with the falling lime.

Kilns in which the fuel and limestones are introduced in alternate layers seldom give uniform results: parts of the charge will be imperfectly calcined, forming *biscuits* as the lime burners term them, or lime which will not slake.

(TO BE CONTINUED.)

[For the American Repertory.]

ON THE EFFECTS OF ARTS, TRADES, AND PROFESSIONS, AS WELL AS HABITS OF LIVING, ON HEALTH AND LONGEVITY.

No. XIV.

Carbonic Acid Gas, (continued.)—There are some facts on record going to show that a very small quantity of the mixed gases, proceeding from the slow combustion of tallow and other oily substances, will produce dangerous symptoms. Every one must have noticed instances where persons could not bear the smell of a candle, and where the vapor into which the oil of a lamp is resolved, previous to its forming flame round the wick, excites intense headache. Indeed an instance is recorded by Ammann, where the emanations from the burning snuff of a candle proved fatal. He states that a party of ironsmiths, who were carousing on a festival day at Leipzig, amused themselves with plaguing a boy, who was asleep in a corner of the room, by holding under his nose the smoke of a candle just extinguished. At first he was roused a little each time; but when the amusement had been continued for half an hour, he began to breathe laboriously, was then attacked with incessant epileptic convulsions, and died on the third day. Dr. Christison thinks that the effects of such emanations are probably owing to empyreumatic volatile oil, which is very actively poisonous.

Although the fumes of charcoal are more likely to lead to accidents than the vapors from anthracite or bituminous coal, yet they are less noxious in their nature. Sea coal gives off sulphurous acid gas, which is exceedingly irritating to the lungs, and thus gives warning of the danger, while no such effects

accompany the burning of charcoal. An instance of poisoning with a mixture of these gases occurred at Lead Hills, in Scotland, in 1817, and is related in the Ed. Med. and Surg. Journal, by Mr. Baird. It appears that the smoke of the steam-engines escaped into the way-gates, and contaminated the air in the workings. Four men, who attempted to force their way through this air into the workings below, were unable to advance beyond, and seem to have died immediately. The rest attempted to descend two hours after, but were suddenly stopped by the contaminated air. As soon as they reached it, although their lights burnt tolerably well, they felt difficulty in breathing, and were then seized with violent pain and beating in the head, giddiness and ringing in the ears, followed by vomiting, palpitation and anxiety, weakness of the limbs and pains above the knees, and finally with loss of recollection. Some of them made their escape, but others remained till the air was so far purified that their companions could descend to their aid. Some ran about frantic and furious, and struck all who came in their way; some ran off terrified whenever any one approached them; some sang, or prayed, and others lay listless and insensible. Many of them retched and vomited. In some the pulse was quick; in others, slow; in many, irregular; in all, feeble. All who could describe their complaints had violent headache, some of them tenesmus, and a few diarrhœa. In a few days all recovered except the first four, and three others who had descended to the deeper parts of the mine.

Similar accidents have happened among coal miners in different parts of England, especially among those employed in the neighborhood of a burning coal mine belonging to the Devon Company. In some of these cases the men were taken ill after they had been at work for a considerable time; and it is worthy of remark that the lights continued to burn in an atmosphere sufficiently loaded with carbonic acid gas to destroy health, and even life. In a case related by Dr. Gardiner, in the Edinburgh Med. Chir. Trans., the principal effects of sleeping in a room of coal smoke, were giddiness, drowsiness, mental confusion, severe headache, and vomiting. Another case is related by King, in the Edinburgh Journal, where four sailors were ex-

posed for 14 hours, in a cabin, to air strongly impregnated with coal smoke. The symptoms which followed were stupor, disinclination to rise, and when three of the sailors were roused, suffusion of the face, rigidity of the limbs, incurvation of the fingers and toes, feebleness of the pulse, and impeded respiration. The fourth individual did not recover.

Such are some of the principal facts and phenomena connected with carbonic acid gas; and the bearing which they have upon human health is so obvious as scarcely to need pointing out. As it is a positive poison to animal life, though the very *pabulum* of vegetable growth, its accumulation in the atmosphere beyond the ordinary proportion must in that degree be inimical to health. It is to this cause, perhaps, more than to all others that the insalubrity of cities is owing, as respiration and combustion, to say nothing of putrefaction and the numerous manufactories, tend constantly to its accumulation. Liebig has calculated that the town of Giesen, in Germany, containing 7000 inhabitants, extracts yearly from the atmosphere, by the wood employed as fuel, more than 1000 millions of cubic feet of oxygen gas, and generates a still larger quantity of carbonic acid gas; and the same distinguished chemist has also shown that in 1000 years the quantity of carbonic acid gas in the atmosphere would be doubled by respiration alone, were it not constantly taken up by the vegetable kingdom. This calculation will enable us to form some idea of the immense quantity of this gas which must be formed in such a city as New-York, and which will accumulate to a pernicious extent, notwithstanding all the precautions as to ventilation which can be adopted. We hence see the absolute necessity of wide streets and open squares; of throwing open public and private dwellings to the free circulation of the air; of removing all decaying animal and vegetable matter, as well as many manufactories, which now contribute extensively to the vitiation of the atmosphere. We believe that it is the breathing of carbonic acid gas which chiefly gives to the inhabitants of all large cities that pale and sallow complexion which distinguishes them from country people, which occasions such a multitude of dyspeptic and chronic complaints, and which causes the extensive mortality of infants and young

children. It is very probable that the *cholera infantum*, a disease known only in large cities, owes its existence to the same cause, for a change of air, with no alteration in diet or nursing, is almost a certain cure. The spasm of hooping cough is also relieved by a removal to country air; and we have seen that a spasmodic affection of the respiratory muscles is one of the symptoms produced by breathing carbonic acid gas. It has been estimated by Thackrah that not 10 per cent of the inhabitants of large towns enjoy full health, and he attributes this chiefly to the impurity of the air. While, therefore, we should endeavor to guard against this insidious cause of disease, by ventilation, frequent bathing, and excursions to the country, we should not forget that there are other causes of ill health connected with our food and drinks, which are of no less importance.

As we shall not again recur to the subject of *asphyxia*, it will be proper here to take a general view of its causes, its phenomena, its theory, and the treatment proper to be pursued under its different varieties.

In the first place, then, whatever excludes or prevents the renewal of oxygenated air in the lungs, gives rise to the phenomena, the sum total of which constitute what is called asphyxia. Among these causes we may enumerate, first, imperfect or impossible action of the inspiratory muscles; second, deficient expansion of the lungs, the inspiratory muscles performing their proper functions. Among the first may be included tight lacing; compression of the inspiratory muscles, from the pressure of earth or other substances upon the body, preventing the expansion of the thorax; deficient or interrupted action of the nerves supplying these muscles, as from division of the pneumagastric nerve, fracture of the spine above the origin of the phrenic nerve, and paralysis from a stroke of lightning, or any other cause; or, lastly, from deficient irritability in the inspiratory muscles themselves, as from the influence of cold, and in the suspended animation of new-born infants. Besides these, which may be termed mechanical causes of asphyxia, there are others of a chemical character, which act by impeding or abolishing the chemical changes effected by respiration. These may be

referred to two classes: first, such as present a mechanical obstacle to the entrance of air into the lungs, as submersion, strangulation, and the introduction of foreign bodies into the trachea and air-passages; second, such as consist of a deficiency of respirable air; as an atmosphere too much rarefied, or the presence of azote, hydrogen, carburetted hydrogen, protoxide of hydrogen, carbonic acid, or any of the poisonous gases already mentioned.—The *phenomena* of asphyxia vary according to the nature of the causes which produce them, and the extent to which the air is excluded from the lungs. When it takes place slowly, it commences with a feeling of uneasiness and distress, an urgent desire to inspire and fill the lungs, giving rise to constant gapings, and quick, short and imperfect respiratory efforts. The body at length becomes agitated and convulsed; vertigo and stupor succeed, with a failing of consciousness and motion; the face becomes livid, and the surface of the body pale, and the individual falls to the ground from the loss of muscular power. The heart however continues to beat, and the circulation is carried on in the large vessels as well as in the capillary system. In a short time the circulation wholly ceases, and the functions of secretion, nutrition and calorification are entirely arrested. Asphyxia is complete.

Where the nervous influence of the respiratory muscles is suddenly arrested from any cause, these phenomena succeed each other with great rapidity; and the duration of life varies according as the causes which occasion asphyxia act with greater or less promptness, or more or less perfectly exclude the air from the lungs. A late writer remarks, that "in general the more slowly abolition of the respiratory function takes place, as in cases of drowning, the longer does the action of the heart continue, although feebly and slowly, even after respiration has ceased; and to this circumstance, as well as to the fluidity of the blood, which is long preserved, is owing the power we possess of recalling the asphyxied to life; the more slowly the state of asphyxia supervenes, the longer the person retains the ability of being reänimated, and *vice versâ*. The length of time, however, after which resuscitation cannot be accomplished is necessarily varied by different circumstances; and not only by

the causes of asphyxia, and their modes of operation, but also the strength of constitution, age, and previous health of the person, and the manner in which abstraction of air has taken place. Much will also depend upon the changes which the asphyxia has produced in the brain—the degree of congestion, or the occurrence of extravasation there—circumstances which, when present to any very considerable extent, more particularly the latter, will generally preclude the possibility of reänimation."

Various theories have been formed by different physiologists to explain the *modus operandi* of the causes of asphyxia, in order to arrive at rational indications of treatment. Of these, the most important are those of Bichât and Dr. Kay. According to the former, the venous blood, in a case of asphyxia, is sent by the contraction of the right side of the heart through the lungs, which at first contains a small quantity of air, but far too little to effect its conversion into arterial blood. On reaching the left side of the heart, the blood stimulates it to contraction, and is transmitted along the arteries to every part of the organism; but as the appropriate stimulant of these organs is blood that has undergone the vivifying influence of air in the lungs, this unconverted or partially converted blood is insufficient for the purpose, and indeed is markedly stupefying and deleterious, so that the organs finally cease to act in consequence of being *poisoned* by the blood sent to them. The vertigo, headache, and loss of consciousness and motion, &c. he ascribed to the influence of blood not *hematosed* or oxygenated, on the brain.

The conclusions to which Dr. Kay arrives, from a large number of experiments, are:—1. That the circulation is arrested after respiration ceases, because, owing to the exclusion of oxygen, and the consequent non-arterialization of the blood, the minute pulmonary vessels, which usually convey arterial blood, are incapable of transmitting venous blood, which therefore stagnates in the lungs.—2. That the arrestation of the circulation is sudden, when the lungs are entirely deprived of air, and that blood ceases to flow from them into the left cavities of the heart, even in the smallest quantity, in about $3\frac{1}{2}$ minutes.—3. That even supposing a great quantity of venous blood were transmitted through the lungs, it would not impair their contractility;

but, on the contrary, it is even capable of supporting this power for a certain period.—4. That venous blood does not possess any noxious quality by which the organic functions of these tissues can be destroyed, but is simply a less nutritious and less stimulating fluid than arterial blood.—Lastly. That the functions of the muscular fibre cease in asphyxia, because the circulation, and consequently the supply of the fluid which is necessary to life, is arrested in the lungs.

It is now conceded by the best physiologists, that the theory of Dr. Kay is the most logical and the best supported by facts. The train of phenomena then is the following:—In consequence of the non-conversion of venous into arterial blood, the circulation is arrested in the capillary vessels of the lungs; the flow of arterial blood towards the left side of the heart is stopped; in consequence of the want of the stimulus of distension, the left cavities lose their contractility, and no more blood is sent to the nervous, muscular, parenchymatous, and other tissues, causing a cessation of the functions of nutrition, secretion, and calorification, which depend on a due supply of oxygenated blood. The functions of the brain are impeded or arrested from the same cause, and thus the whole system suffers from the want of the usual supply of nervous energy.

The *general treatment* of asphyxia must be founded on the causes which produce it, their mode of operation, and the ultimate results which they occasion. The chief indications are, to remove the individual from the causes that brought on the asphyxia, and then apply those means best calculated to restore the suspended functions of respiration, circulation, and innervation, which mutually reäct on each other, and therefore require the simultaneous application of remedies to each. Our first object, then, should be to dislodge the impure air remaining in the lungs; secondly, replace it with pure air; thirdly, excite the remaining vitality of the nerves and muscles; and lastly, restore the circulation, if possible by measures calculated to return the blood to the left side of the heart. The patient should be stripped of his clothing, wrapped in a warm flannel blanket, and placed on his back in the open air, in a temperature of from 65 to 70° Fah.; for a higher temperature than this exhausts the

nervous action and retards recovery. Artificial respiration is now to be carried on, and the mode recommended in the last Report of the Royal Humane Society of London is perhaps the best. A piece of strong flannel, an old blanket, sheet, or other cloth most easily attainable, is to be cut into a strip six feet long and eighteen inches broad, and this is to be cut or torn lengthwise into six strips, each one being two feet long and three inches broad. The untorn portion (two feet in length and eighteen inches broad) is to be placed under the back of the patient, from the arm-pits to the upper parts of the thigh bones. The strips are then to be brought together over the chest and abdomen, interlacing each other from the opposite sides, as the fingers are interlaced in clasping the hands. The strips, thus arranged, are to be gathered into a bundle on each side, and if they are then drawn in opposite directions by two assistants, the edges of the bandage will be made to approach, and firm and equal pressure will be produced on the chest and abdomen. The assistants, having thus compressed the body of the patient by drawing the bandage in opposite directions, should then relax it, permitting the chest to reëxpand, and performing this process at the rate of about twenty times in the minute. If the head and shoulders be elevated, the contents of the abdomen, on the relaxation of the pressure, will cause the diaphragm to descend by their gravity, and will thus enlarge the chest. By applying the flame of a candle or the fine down of a feather to the mouth and nostrils, it will be seen that on each firm pressure by the bandage, air is expelled from the lungs, and on the relaxation of this pressure the chest regains its original size, and air rushes in; or pressure may be made upon the breast and abdomen, alternating with relaxation, so as to imitate the actions of the chest in respiration. In this manner the foul air will be thrown out of the lungs, and the restoration of the capacity of the thorax upon the removal of the momentary pressure, by the elasticity of the costal cartilages, will draw fresh air into the lungs. It will be of service also to apply a hand on each side of the thorax below the arm-pits, and by gentle shocks endeavor to expel the vitiated air. We have been in the habit also of inserting the pipe of a pair of bellows into one nostril, whilst the mouth and

opposite nostril are closed by an assistant, and the windpipe in the superior prominent part is gently pressed back; then, by forcing air into the lungs, and alternately expelling it by pressing the chest, respiration may be imitated. In this way, air may be sent into the lungs about 20 times in the minute, so as to imitate natural respiration as nearly as possible. If a bellows is not at hand, air may be forcibly blown into the lungs by applying the mouth to that of the patient, closing his nostrils with one hand, and quietly expelling the air again by pressing the chest with the other or by the aid of an assistant. If the lungs cannot be inflated in this way, the operator should blow into one nostril, having closed the other and the mouth; and if a small wooden tube or silver canula can be procured, one end of it may be inserted into the nostril, and the air blowed through it. There is one objection to this process, which ought to give the former mode of operating the preference whenever practicable, and that is the vitiated state of the air as breathed from the lungs, it having lost a portion of its oxygen, which is essential to the due establishment of the respiratory functions. Some physiologists, however, consider that the elevated temperature of the air expired counterbalances the disadvantage of less purity, which may be possible, when we consider that it loses not more than three parts of its oxygen, which are replaced by carbonic acid gas. In no case should air be forced violently into the lungs, on account of the danger of rupturing some of the pulmonary vesicles, allowing the air thus to escape into the cavity of the pleura, which would consequently press upon the lungs, so that they cannot be inflated.

As the circulation of the blood depends on respiration, the importance of establishing this function at as early a period as possible is too obvious to need remark. But while we are aiming to do this, we should not fail to employ warm, stimulating *frictions* to the surface, particularly to the extremities, by which we solicit the blood into the capillary vessels, and thus communicate a shock to the greater and more important parts of the vascular system; whilst the excitation of the subcutaneous nerves is transmitted to the brain, and thence to every part of the body. *Friction* may be made with the warm hand, or with

a leather glove, a piece of flannel, or the flesh brush; and stimulating liniments and embrocations would facilitate the object in view. *Galvanism* and *electricity*, when practicable, will be found powerful remedies in reviving the dormant powers and hastening resuscitation, though they are seldom available. *Bleeding* is highly useful where the countenance is swollen and purple, and the veins turgid, although there is generally great difficulty in obtaining blood. During the progress of recovery it is especially indicated when the respiration is laborious, the brain loaded or oppressed, and when delirium succeeds, which is a frequent attendant on restored animation. Some writers have denounced blood-letting in all cases of asphyxia; but so far as our experience goes there are but very few cases in which a moderate abstraction of blood is not beneficial. As soon as the patient is able to swallow, internal stimulants, such as brandy and water, ammonia, &c. will be highly useful.

The measures above recommended should be persisted in at least two hours, unless unequivocal indications of death present themselves, such as stiffness of the limbs, &c. The first signs of returning animation are convulsive snatches of the respiratory muscles with gaspings, followed by sighing and slight palpitations: the respiration gradually grows more natural; the circulation begins to be reëstablished, and the patient will probably recover unless convulsions set in, which sometimes happens even after a considerable time has elapsed. In such cases, bleeding and artificial respiration furnish almost the only chance of saving the patient.

These general rules are applicable to the treatment of most cases of asphyxia, brought on by any cause whatever. In cases where carbonic acid gas has been inhaled, stripping and exposing the body to cool air, and dashing cold water upon the face and chest are indispensable. Friction over the chest must also be employed, and ammonia held to the nostrils.

Where asphyxia has resulted from *submersion*, the directions already given should be followed. In addition, the frothy mucus should be removed from the fauces by the finger enveloped in a handkerchief; and while artificial respiration is carried on, the warmth of the patient should be somewhat increased by the

application of bottles of warm water, or warm bricks or flannels to the feet, knees, armpits, pit of the stomach, and along the spine. The warm bath has been recommended, but it is more likely to prove injurious than beneficial, from the circumstance that it prevents the access of air to the body, while, if the experiments of Milne Edwards are to be depended upon, water exerts an injurious influence on the nervous and muscular systems. The absurd practice of hanging up the drowned by the heels, and rolling upon casks, is far more likely to extinguish than resuscitate the dormant spark of life, and should be altogether abandoned.

Asphyxia from *strangulation*, as *hanging*, requires the same measures already described, and particularly bleeding, which should, if possible, be performed in the jugular vein, as the brain is surcharged with blood. The head and shoulders should be more elevated than in cases of apparent death from drowning, and if a restoration of animation be effected, the usual means of guarding against congestion of the brain, to which this organ is particularly liable in such cases, should be promptly resorted to. In cases of hanging, death chiefly occurs from the action of the cord interrupting the function of respiration, and not alone from the pressure on the jugular veins, interrupting the return of blood from the brain, and causing apoplexy, as some writers have maintained.* In many instances, the vertebræ of the neck are luxated, causing a lesion of the spinal marrow, and of course rendering ineffectual all remedial measures.

Where asphyxia results from *obstruction of the glottis and larynx*, or from substances having passed into this situation or into the

* There are several instances on record, where attempts have been made to save the lives of criminals by making an opening into the trachea. A remarkable case of this kind occurred in Scotland, at the commencement of the last century. A man by the name of Gordon, who had been sentenced to be hanged for highway robbery, and who had become very rich by his avocation, offered a large bribe to induce a young surgeon to attempt to defraud the law of its victim. An incision was made in his neck, and a tube was introduced through it, into the trachea, in such a manner that respiration might go on, if the upper part of the neck were constricted by the cord. The man was, however, very heavy, and the neck was probably luxated; for after the body had hung the usual time, it was cut down and handed over to the surgeon, who opened the jugular vein, and used the other means of resuscitation, but in vain; once the man opened his eyes and sighed; but this was all.

trachea, the operation of *tracheotomy*, or opening the windpipe, will be expedient. A few years since we were summoned in haste to attend a fine little girl of seven years of age, who was suddenly taken ill while eating her dinner. On arriving at the house in a few moments, we found her rapidly falling into a state of asphyxia. Suspecting the cause, we proposed to the parents to open the trachea, as the only chance for her life. They utterly and promptly refused; the father observing, that he would rather his child should die a *natural* death than to have her throat cut. The next day we were again sent for to examine the body, as a report had got into circulation that the girl had been poisoned, and the parents wished to know whether there was any foundation for it. On opening the trachea, which was the first part to which our attention was directed, we found a solid piece of beef, about as large as a chestnut, completely obstructing the passage, and which could easily have been removed by the operation of tracheotomy. The parents saw, too late, that they had lost their child, in all probability, from their own obstinacy and ignorance; and we mention the case here only that others may learn wisdom, and *not* do likewise.

With regard to the time during which a person may remain in a state of asphyxia, and then be resuscitated, nothing very definite has been ascertained. In cases of drowning, reänimation has in several instances appeared where the body had been submerged for three quarters of an hour. Of 23 persons recovered from drowning by the Humane Society of Paris, one had been three quarters of an hour under water; four, half an hour; three, a quarter of an hour; and the rest for shorter periods. As a general rule, if the submersion has not exceeded five minutes, the efforts at resuscitation, if properly conducted, will probably be successful. After 15 minutes, recovery is not very common; after 20 or 30 minutes, it may be considered as almost hopeless. We however often find that immersion for a very few minutes only often seals the fate of the sufferer. Much depends on the difference of resistance in individuals, referable to age, constitution, health, and the rapidity or slowness with which suspended animation has been induced. Dr. Edwards has moreover very clearly demonstrated that life is more rapidly

extinguished by submersion in water of a very low temperature than in that of higher grades, evidently owing to the sedative effects of cold upon the nervous system.

M. Julia, whose "*Recherches*," &c. was crowned by the Royal Academy of Sciences of Lyons, in 1823, quotes Herodotus to show that a person named *Scyllias* could readily travel two leagues under water; and Radzivil, who states that he has seen some of the Egyptian fishermen remain whole days under water without rising to the surface to breathe; and the same writer mentions the case of a man who was said to have lived five years under water, and yet rose again with life; and the same writer remarks, that no one is ignorant that the drowned have been restored to life after having remained two days under water.

Dr. Dunglison, from whose able Essay we have compiled much of this article, remarks, that "Dr. Lefevre, of Rochefort, who was lately stationed at Navarino, had ample opportunity of putting the powers of the best divers to the test. He witnessed the performances of those who were employed to fish up the relics of the Turkish fleet sunk in Navarino harbor. The depth to which they had to plunge was 100 feet; but though the Greek divers are, and have always been, famous for their prowess, none of them could sustain submersion for two whole minutes together: 76 seconds was the average period in 14 instances accurately noted; and frequently, after reaching the surface, blood issued from the mouth, eyes and ears of the swimmer. But in general these people can repeat their task three or four times in an hour."

All the facts which we have been able to gather seem to prove pretty conclusively, that efforts at resuscitation in cases of drowning will be fruitless, as a general rule, after a perfect asphyxia of a few minutes duration. We once succeeded in restoring a man who had been entirely covered with sand for 45 minutes; but resuscitation in this case was probably owing to the porosity of the sand, and the circumstance that he had been able to excavate a small cavity around his head.—The asphyxia of new-born infants does not properly fall within the scope of these essays.—In cases of asphyxia from lightning, dashing of cold water upon the body is the best remedy.

[For the American Repertory.]

REPLY TO THE WRITER "ON THE STEAM-ENGINE."

[Continued from p. 419.]

Resistance of Fluids and Latent Heat of Steam.

It has been aptly remarked by a keen observer of human imperfections, that the follies of dotage eclipse all other follies. The explanation of this anomaly will be found in the fact, that while the intellectual and reasoning powers give way with the physical energies of man's constitution, vanity not unfrequently increases towards the closing scenes of active life. These remarks are called forth by the article in the last number of the American Repertory on the above subjects, and submitted with a view to relieve the reader's astonishment, and to assist in solving the puzzle again presented by the writer "On the Steam Engine," the founder of those remarkable theories by which the resistance of fluids is diminished one half, and by which the phenomenon formerly attending the transition of water into steam is arrested. Discoveries having for their aim so great a diminution in the stubborn resistance of an element, prescribing such narrow limits to the celerity deemed necessary in social and commercial intercourse, and which discoveries, by removing the *latent* principle, obviate the waste of heat hitherto attending the formation of steam, certainly demand serious attention, and merit a place in the pages of the American Repertory. Be this as it may, unless admitted into a journal of so much repute I should deem it derogatory to notice any communication having for its object to lay *such* discoveries before the public.

In replying to the article alluded to, I will entirely pass over the invectives of your correspondent as worthless; they are without point, and have no bearing on the question further than being indications of an imbecile mind. I will therefore at once proceed to discuss theory No. 1, which proves that the force or resistance of fluids against bodies is in the direct ratio of the velocities, instead of being, as all the world have believed, as the square of the velocities. But let our experimentalist speak for himself:—" First, to extricate this matter from its utter con-

fusion, we experimented with two model boats, of equal forms and weight, which were drawn through the water by cords passing over pulleys, to which cords different weights were appended. The speed, or space passed over by the respective boats *in the same time*, increased *exactly as the weights were increased;* for while one boat, drawn by a given weight, passed over a measured space, the other similar boat (drawn by a weight *twice as heavy* as the weight attached to the first boat) passed exactly over *twice the measured space* in the *same time* as the first boat. But as the double weight descended also to a double depth, it is evident that *four* times the *power* was expended in drawing the second boat through a *double* space in the *same* time. But then the actual expenditure of power (or fuel) is evidently and really *only double* for traveling at *double speed;* (!) because *quadruple* power evidently realizes not only double speed, but double distance also."

In calling the reader's attention to this ridiculous statement by which it is as clearly expressed that *double speed requires only double force*, and that because double speed requires double expenditure of power, *quadruple power will give double speed*, I might with justice apply some of those epithets which, in his desperate struggles to defend an absurd theory, your correspondent uses to prejudice the reader's opinion. But it would be ungenerous not to exercise forbearance towards the fallen; and as the reader perceives my adversary is prostrate, I am bound to be lenient; and, therefore, instead of animadverting on his conduct in attempting to veil the errors he has committed, and to throw dust in the eyes of the readers of the American Repertory by sinister assaults on my reputation, I will find an excuse for him from reasons suggested at the commencement of this article, and on the score of his indistinct knowledge of *power* and *force*. Had he known that *force* is the constant energy requisite to move a body, and that *power* is that energy multiplied by the velocity, he would have been spared the unfavorable opinion to which he has subjected himself by his mistakes and confused exposition—I will not say intentional misstatements—of my former arguments; mistakes originating conjointly in his miniature experiment in the water tub, above referred to, and his

confounding the *force* or *resistance* offered to bodies at given velocities with the *power* requisite to produce those given velocities.

It would be superfluous again to give the *reasoning* which proves that the resistance of fluids must, from the very constitution of matter and motion, of necessity be as the square of the velocity; but I beg to call the reader's attention to the extract of Col. Beaufoy's experiment, vol. iii, p. 351, in which the fact is so amply proved by practical test. The resistance being thus established to be *four* times for *double* speed, whilst the expenditure of power manifestly will be *twice* as rapid, it follows that *double* speed requires *eight* times the power during equal intervals of time. In other words, the *resistance* offered to a vessel increases as the square of the velocity at which it is moved; but the *power* necessary to produce that velocity increases as the cube.

The self-evident nature of the whole question would certainly induce me to call upon your correspondent to come forward and admit frankly that he had fallen into an error, did I not know from his tortuous course, and the expedients he resorts to, that he is incapable of candor and fairness as a controvertist. Fully convinced on this point, I can only inform him that I know of more than one scientific institution where a schoolboy would be whipped for saying, that "by doubling the speed of a body the resistance is only doubled, and the requisite power only quadrupled."

Theory No. 1 being thus disposed of, I will now proceed to consider as briefly as possible the startling theory No. 2, which clearly establishes the fact that no one but its founder can give a correct definition of the word *latent;* proving, moreover, that those poor philosophers Black, Lavoisier, Davy, Wollaston, Ure, Faraday, and all the scientific world beside, have been laboring under a most egregious mistake in supposing that steam contains latent heat, because your correspondent finds it unpleasant to immerse his finger in a stream of 'genuine' steam issuing from a pipe in his kitchen. It would be curious to know how often our ardent experimentalist has repeated this interesting trial of putting his finger into the genuine steam jet; and it is hoped that if the cause of science is to be further promoted by such

desirable and conclusive tests, that the water-tub in which the new law of resistance was settled may be near at hand, to facilitate the reduction of any undue temperature of the part thus exposed by the owner in his determined course to "correct or uproot existing errors, and to remove an incubus that has long pressed so heavily on, and retarded so much the advancement of this particular branch of science."

Your correspondent, in his attempts to defend an untenable position, has finally got himself into a complete labyrinth, by mixing up the *elements* of heat with heat itself; thus, in further proof of the non-existence of latent heat in steam, he institutes a comparison between it and some unknown principle inherent in combustible substances, and thinks his point established, because those substances do not part with their heat by being brought in contact with other cold substances: an idea more crude, or a comparison more inappropriate, cannot well be conceived.

The theory of heat being as yet a complete mystery, we only know for certain that when a combustible is brought in contact with a supporter of combustion, and raised to a given temperature, combustion takes place, and heat is developed; but until so developed or generated, it would be irrational to speak of its absolute existence; in which opinion I am supported by the highest authorities, some of which I will quote, not only to prove that the nature of heat is as yet a speculation, but also to show the great impropriety of instituting any comparison whatever between the latent heat of steam, and the unknown principles contained in those substances which by combination with each other, under certain conditions, are found capable of developing heat.

Dr. Young, so remarkable for his clear deductions in experimental philosophy, and whose peculiar optical discoveries give great weight to his theories or suggestion on this point, says:— "The nature of heat is a subject upon which the popular opinion seems to have been lately led away by very superficial considerations. The facility with which the mind conceives the existence of an independent substance, liable to no material variations except those of its quantity and distribution, espe-

cially when an appropriate name and a place in the order of the simplest elements has been bestowed on it, appears to have caused the most eminent chemical philosophers to overlook some insuperable difficulties attending the hypothesis of caloric. Caloric has been considered as a peculiar elastic or ethereal fluid, pervading the substance or the pores of all bodies, in different quantities, according to their different capacities for heat, and according to their actual temperatures; and being transferred from one body to another, upon any change of capacity or upon any other disturbance of the equilibrium of temperature; it has also been commonly supposed to be the general principle or cause of repulsion; and in its passage from one body to another. by radiation, it has been imagined by some to flow in a continual stream, and by others in the form of separate particles, moving with inconceivable velocity at great distance from each other.

"The well known fact respecting the production of heat by friction appears to afford an unanswerable confutation of the whole of this doctrine. If the heat is neither received from the surrounding bodies, which it cannot be without a depression of their temperature, nor derived from the quantity already accumulated in the bodies themselves, which it could not be even if their capacities were diminished in any imaginable degree, there is no alternative but to allow that heat must be actually generated by friction; and if it is generated out of nothing, it cannot be matter, nor even an immaterial or semi-material substance.

"If heat is not a substance, it must be a quality; and this quality can only be motion. It was Newton's opinion that heat consists in a minute vibratory motion of the particles of bodies, and that this motion is communicated through an apparent vacuum by the undulations of an elastic medium, which is also concerned in the phenomena of light.

"It is easy to imagine that such vibrations may be excited in the component parts of bodies by percussion, by friction, or by the destruction of the equilibrium of cohesion and repulsion, and by a change of the conditions on which it may be restored, in consequence of combustion or of any other chemical change.

It is remarkable that the particles of fluids, which are incapable of any material change of temperature from mutual friction, have also very little power of communicating heat to each other by their immediate action; so that there may be some analogy in this respect between the communication of heat and its mechanical excitation."

In connection with this interesting subject, I cannot refrain from quoting Sir Humphrey Davy, celebrated for his bold and correct suggestions, and sublime solutions of the mysteries of nature, by the application of simple mechanical laws; he says with regard to heat: "The laws of its communication are precisely the same as the laws of motion. Since all matter may be made to fill a smaller volume by cooling, it is evident that its particles must have space between them; and since every body can communicate the power of expansion to a body of lower temperature, that is, can give an expansive motion to its particles, it is a probable inference that its own particles are possessed of the same motion; but if there is no change in the position of its parts as long as its temperature is uniform, the motion, if it exists, must be a vibratory or undulatory motion, or a motion of the particles round their axes, or a motion of particles round each other." Sir Humphrey Davy further observes:—"It seems possible to account for all phenomena of heat, if it be supposed that in solids the particles are in a constant state of vibratory motion, the particles of the hottest body moving with the greatest velocity and through the greatest space; that, in liquids and elastic fluids, besides the vibrating motion, which must be conceived greatest in the last, the particles have a motion round their own axes with different velocities, the particles of elastic fluids moving with the greatest quickness; and that, in ethereal substances, the particles move round their own axes, and separate from each other, penetrating in right lines through space. Temperature may be conceived to be dependent on the velocity of the vibrations; increase of capacity on the motion being performed in greater space; and the diminution of temperature, during the conversion of solids into liquids or gases, may be explained on the idea of the loss of vibratory motion in consequence of the revolution of particles round their axes, at

the moment when the body becomes liquid or aëriform, or from the loss of rapidity of vibration in consequence of the motion of the particles through greater space."

To urge anything farther respecting our want of knowledge as to the nature of heat would be superfluous: enough has been said to show the absurdity of practically taking any cognizance of heat not yet developed, and the great impropriety of mixing up the question of latent heat in steam with certain unknown principles inherent in combustible matter. Our business is to deal with heat, not *before* but *after* its development—something that really has existence. The *latent* heat of steam, although it is imperceptible on the thermometer or to our senses, is still subject to accurate admeasurement: first, by ascertaining the precise quantity of heat imparted to the water during the formation of the steam, do we arrive at a correct estimate of the amount of latent heat; and secondly, by condensation, a fluid being used for that purpose, the capacity for heat of which is accurately known.

I am constrained to inform your correspondent that he has bestowed an unmerited compliment on me by giving the name of "*Ericssonum*" to the contrivance which sometime ago I submitted to the readers of the American Repertory, in order to present the question of latent heat in a practical form: the idea belongs to an eminent chemical philosopher of the day: I have myself been present at a lecture where the satisfaction of a numerous and highly intelligent audience was strongly expressed at the practical and incontrovertible evidence of latent heat which such a mode of considering it furnished.

Respecting your correspondent's allusion to his steam pipe with the stopcock; his invitation to his friends to try the "agreeable, pleasant and delightful" sensation attending the immersion of a finger in the 'genuine' steam jet; and his doing all this "free, gratis, for nothing but the love of truth,"—is prattle as unworthy of any reply as it is of a place in a scientific journal. The main question suggested by the misnamed contrivance is simply: What becomes of the heat imparted to the water after it has arrived at the boiling point, the thermometer then ceasing to indicate any further rise of temperature, the

application of heat being uninterrupted, and there being no addition of ponderable matter? This query having been repeatedly put to your correspondent without any attempt at a reply on his part, we must infer that the subject is beyond his capacity. We are, however, not at a loss, since the results of the labors of the most eminent philosophers, during a century, give for answer that the heat becomes latent during the transition of water into steam. J. E.

New-York, August, 1841.

[For the American Repertory.]

MATHEMATICAL PROBLEMS.

Perceiving a number of able mathematicians among the correspondents of the Repertory, I would respectfully request a solution of the following problems:—

1. To determine the value of n° in the equation $\sin(30^\circ+n^\circ)+\sin(30^\circ-n^\circ)+\sin(90^\circ-n^\circ)=a$?

2. To determine the value of n° in the equation $\sin(90^\circ-n^\circ)-\sin(30^\circ-n^\circ)=a$?

3. Of n° in the equation $\sin(90^\circ-n^\circ)-\sin(30^\circ+n^\circ)=a$?

4. Of n° in the equation $\sin(30^\circ+n^\circ)+\sin(30^\circ-n^\circ)=a$?

5. Of n° in the equation $\sin(90^\circ-n^\circ)\times(\overline{\sin(30^\circ+n^\circ)+(\sin 30^\circ-n^\circ)})=a$?

6. Having the sum, together with the sum of the cubes of all the terms in an arithmetical series, of which the first term and ratio are equivalents, to determine the series?

7. In a similar progression, having the first term and sum of the cubes of all the terms, to determine the series?

8. Having the length of a line drawn from the vertex B, of an equilateral triangle BCD, to some point A, in the opposite circumference of the circumscribing circle, also the length of a line inflected from A to one of the extremities C of the base, therefrom to determine the circle?

9. To extract the square root by a table of natural sines?

D'ALEMBERT.

Pittsford, Vt. August 28, 1841.

For the American Repertory.

MARINE ENGINES.

It is conceded by all who are well informed on the subject, that the American steamboat machinery is very considerably lighter than that of the British steamers, owing—(1) To the simplicity of the American engines; (2) to the employing very slight substances in cylinders, air-pumps, condensers, valve boxes and pipes, &c. and the judicious construction of the working beam; (3) to the saving of materials consequent on the long stroke invariably used in American engines, by employing which it is manifest that the strain, not only on all the working parts of the engine (excepting the paddle-shaft, as far as tortion is concerned) but also on the whole of the framework, becomes reduced nearly in the inverse ratio of the increased length of stroke—the length of the working beam, it is proper to observe, not being proportionably increased; (4) and chiefly, the reduced weight of the American steamboat machinery, is owing to the peculiar mode of constructing the engine frame, viz. the skillful combination of wood and iron.

This extreme lightness of machinery and framework of an American steamboat engine never fails at first sight to arrest the attention of those who are conversant with the British marine engine; and the comparatively great distance from the bottom of the steam cylinder to the centre of the working beam of one of the large Hudson-river steamers, the light material of which this very high frame is constructed, and its perfect stability, that, notwithstanding, can scarcely fail to call forth the suggestion, why might not the same light material be substituted for cast iron in the sea-going steamers? This rational question has been most satisfactorily answered by the U. S. Government, in ordering the steam frigate Missouri to be so constructed; and no one, who has lately visited this very imposing war steamer, can arrive at any other conclusion than that the wooden frames supporting her engines will prove more secure than if made of cast iron, whatever the form and arrangement may be. The reflection forces itself on the mind, what can happen to this wooden frame by the working of the ship at sea? and the in-

controvertible answer will be, that whilst a *cast iron* frame may possibly be broken, the engine frame of the Missouri will remain secure, by accommodating itself to that powerful though slight yielding to which a large ship, however strongly built, is subject in a heavy sea.

But another advantage, scarce inferior to the one just stated, presents itself to the attentive examiner of the Missouri's engine frames, viz. the increased stability to the bottom of the vessel promoted by these frames, the timbers of which, well braced by iron bolts, form a complete truss, which will act most powerfully in preventing the vessel from what is technically called 'hogging,' in the very place where the greatest weight is placed. Altogether, the Missouri's engines reflect great credit on the engineer, Mr. Copeland, and promise perfect success to this ship, which, besides being the largest steam frigate, will not only bear advantageous comparison to anything afloat, but it is reasouable to expect will prove the most secure steam ship *yet* built.

But important as are the advantages of the Missouri's engines compared to those of the British steamers, there is still another modification of the marine engine just brought out by two engineers of this city, Mr. James Cunningham of Phœnix Foundry, and his able assistant Mr. Peter Hogg, possessing still greater advantages. A single glance at the drawing, annexed to these remarks, explains the nature of the arrangement proposed by these engineers ; a very brief description will therefore suffice.

Having before alluded to the advantages of a wooden frame for supporting the engines, when constructed on the principle of a truss, as tending powerfully to increase the stability of the ship, it need only be remarked that in this new arrangement, which in contradistinction to others it is proposed to call the right-angular engine, this important object is attained more completely than in the Missouri, as the right-angular framing will extend the *whole length* of the engine room ; being so narrow that it will admit of the boilers being placed by its sides.

AA represents a side elevation of the engine frame, consisting of four principal timbers placed at an angle of 45°, their lower ends abutting on the keelson, their upper ends being secured to

two upright timbers by caps of cast iron, which also form pillar blocks for the paddle-shaft; additional strength being given to the frame by a series of diagonal timbers intersecting each other, as shown in the drawing; eight strong iron rods, with turn buckles, securing the caps and pillar blocks to the keelsons and bottom of the ship, besides which there are similar iron rods passing diagonally through the frame, keelsons and the bottom of the ship, one for each diagonal timber.

BB—Two steam cylinders placed at an angle of 45°, firmly secured by wrought-iron bolts to the four principal inclining timbers, and also to the keelsons.

C—Paddle shaft.

D—Double crank on the paddle shaft.

EE—Connecting rods between the crossheads of the piston rods and the crank-pin.

FF—Two condensers communicating with the valve boxes of the cylinders, as shown by the drawing.

GG—Two air-pumps, worked by two bell crank beams,

HH—Connected to the crossheads of the engines by ordinary slings or coupling rods.

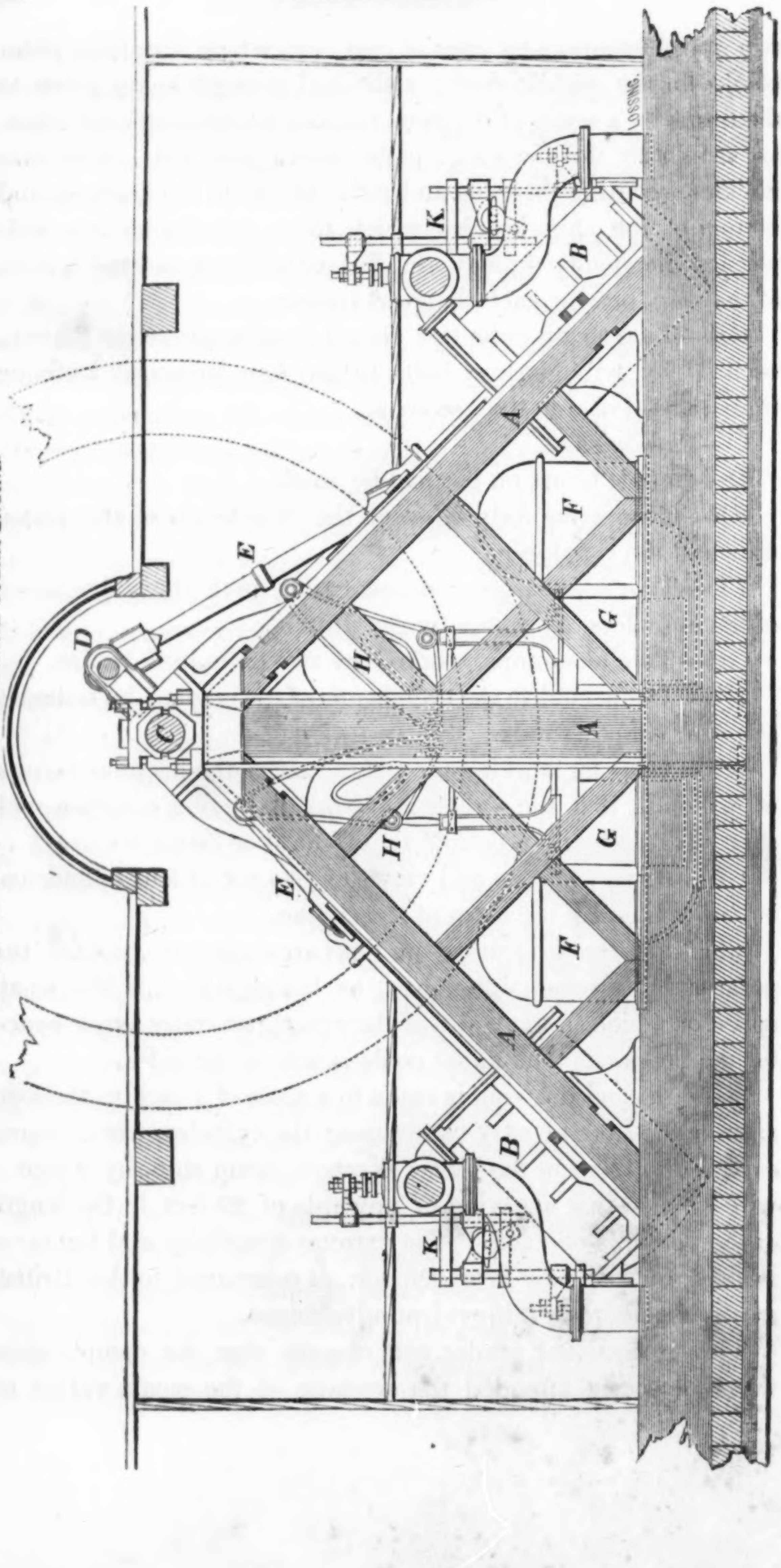
KK—Gear for working the steam valves, the peculiar feature of which is, that the valves are worked by one common rock shaft provided with a double set of 'toes' or lifting levers.

LL—Represents the end views of two out of four cylindrical boilers placed by the sides of the engine.

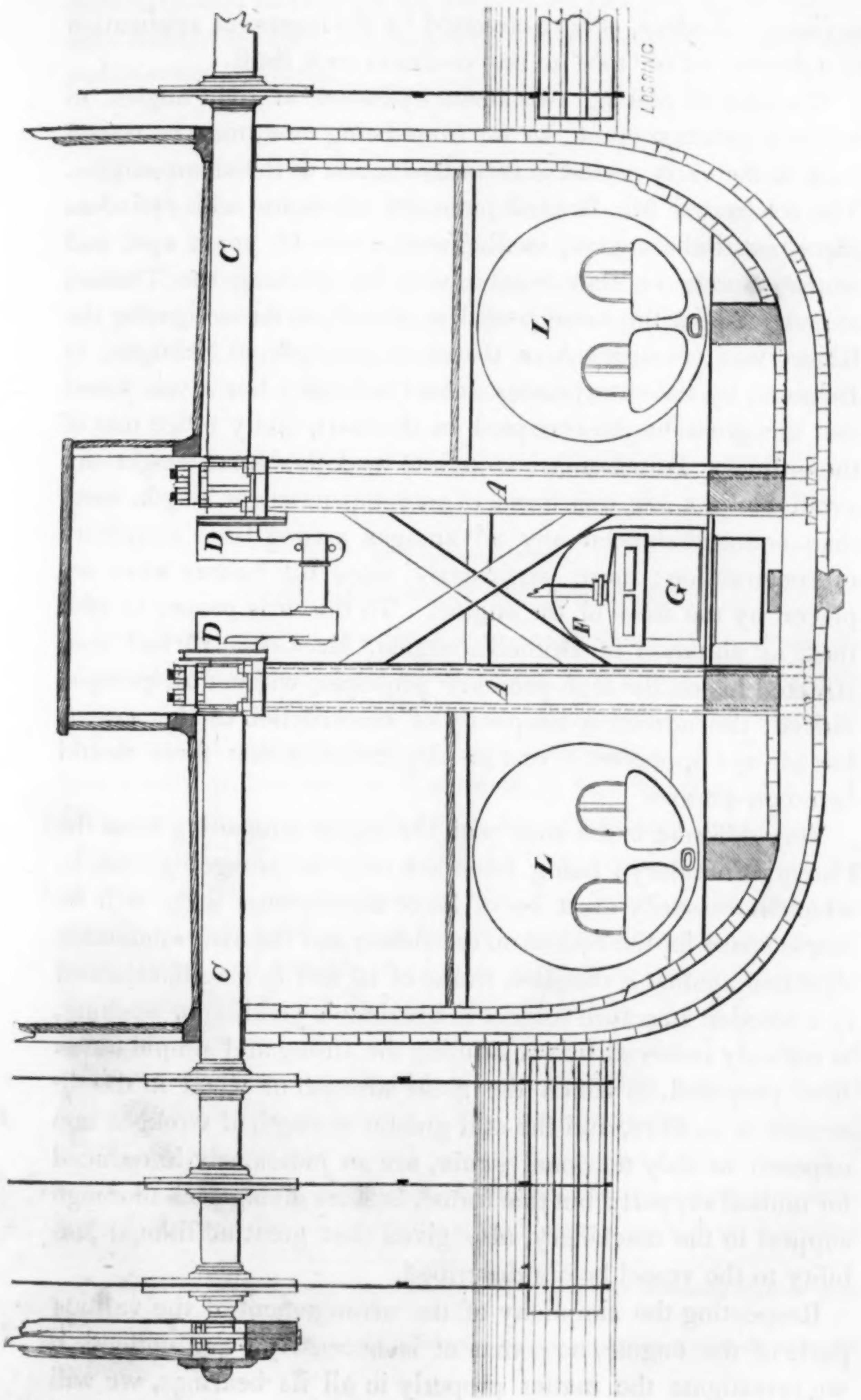
The remarkable feature in this arrangement, besides the great stability which it secures, as before stated, is the small space occupied in the width of the vessel, whereby ample space for the boilers as well as for coals is left on the sides.

The annexed drawing is made to a scale of $\frac{1}{8}$ inch to the foot, and for the sake of easy comparison the cylinders are of equal capacity to those of the Great Western steam ship, by which it will be seen that a saving of upwards of 20 feet in the length of the vessel is effected. The extreme simplicity and lightness insured by this new arrangement, as compared to the British marine engine, are self-evident advantages.

The professional reader will observe that the complication which formerly attended the working of the steam valves of



CUNNINGHAM AND HOGG'S NEW MARINE STEAM-ENGINE.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inclining cylinders, is here obviated by the ingenious application of a double set of 'toes' to one common rock shaft.

The idea of placing two steam cylinders at right angles, to act on a common crank, so far from being new, may be traced back to the early period of the introduction of the steam-engine. The celebrated Mr. Brunell patented an engine with cylinders placed at right angles, in England, about 18 years ago, and employed one on that construction for draining the Thames tunnel. About the same period, a steamboat for navigating the Rhine, was constructed, on the same principle, at Seraigne, in Belgium, by the enterprising John Cockerill; but it was found that the great length occupied in the boat, (fully twice that of the ordinary British marine engine) and the great weight unavoidable in a *cast-iron* frame of such inconvenient length, more than counterbalanced any advantages arising from simplicity of construction; more particularly, since the boilers were not placed by the sides of the engine. To this it is proper to add, that, in imitation of Brunell's engine, Mr. Cockerill had constructed his on the high-pressure principle, without air-pumps; indeed, the admitted simplicity of construction of this engine has always appeared to rest on the condition that there should be no air-pumps.

Very different is the case with the engine emanating from the Phœnix Foundery; being intended only for sea-going vessels, which necessarily must be of large dimensions, there will be ample space for the boilers on the sides; and the insurmountable objection against a cast-iron frame of 40 feet in length, attached to a wooden structure subject to irresistible yielding or working, is not only removed by substituting the strong and simple frame here proposed, in which the great strength of wood in the direction of its fibre, and the still greater strength of wrought iron exposed to only tensional strain, are so judiciously introduced for mutual support; but this frame, besides giving such thorough support to the machinery, also gives that great additional stability to the vessel before described.

Respecting the simplicity of the arrangement of the various parts of the engine, no comment is necessary; and, indeed, if we investigate the matter properly in all its bearings, we will

find it difficult to disprove the proposition that the marine engine here noticed is superior to anything yet constructed for sea-going *paddle-wheel* steamers. J. E.

[The punishment due to our errant chivalry has fallen upon us! We interposed the editorial shield to save a worthy invention from harm, and lo! we are incontinently invested with the title of defender. Well—it suits our humor; and in virtue of the office, we have appended to the following philippic (we like to call things by their right names) a running comment, explanatory and corrective of its misstatements and obscure passages. * * * * * But we have met its levity, its 'fleers, and gibes, and notable scorns,' with sober earnestness. We cannot play at wits when a reputation is the stake—*Ed. Am. Rep.*]

For the American Repertory.

THE ERICSSON PROPELLER.

In a late number, we produced many facts (1) to show the absurdity of A. S. Byrne's unwarranted laudations of Ericsson's peculiar propeller, at p. 348, vol. ii. As "J. E." has not found it convenient to disprove these facts, the editor of the Repertory has kindly undertaken to dry-nurse J. E.'s bantling (2); and, like many other tender nurses, he has overnursed it to death.

We confess ourselves guilty of the error with which he charged us, of misrepresenting the true form of the Ericsson propeller, and have only to say in extenuation—and we say it with shame and sorrow—our error arose from our believing the description which "J. E." himself gave of it. In a fierce dispute in which "J. E." was long engaged in the N. Y. Herald with Mr. Bennet of Arlington House, who long urged with the greatest earnestness the only angle for a propeller (for steering a balloon against the wind) was $17\frac{1}{2}$ degrees; while "J. E." with greater ardor, maintained that 45 degrees was the only veritable angle for all propellers, and never ceased so insisting

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(1) Facts relating to some experiments with a propeller *essentially different* from that of Ericsson.

(2) That is, we corrected in the mildest terms an erroneous statement as to the propeller.

till he had convinced his learned antagonist of the truth of that wonderful discovery, and which, probably, but for our unlucky interference, would have astonished posterity.(3)

Could we—ought we—to have doubted, then, that 45 degrees was the only proper angle for a propeller, after such a full investigation and solemn decision by such an equal pair of scientific luminaries? On the contrary, so strongly were we impressed by the arguments of the victor on this awful occasion, that when we subsequently visited the Clarion, and keeping at a respectful distance, saw one of the propellers on a scaffold, its general appearance so much corresponded with the description in the Herald, that we, nothing doubting, considered this one-angled propeller (4) (useful or not) the genuine, veritable production which "J. E." had on oath patented as a great improvement on the Archimedean screw.

But as pleasing visions soon end, we find our crediting "J. E.'s" description was a great mistake, as the learned editor states that "J. E.'s" propelling surfaces consist of a series of spiral or winding planes, so formed that the progressive movement through the water is alike in every part.

Now, never having seen such a geometrical figure as a spiral or winding plane, we are little at a loss to comprehend it; (5)

(3) The contrition expressed by the writer for his offense, has disposed us to clemency; but the plea in extenuation fails him. His error consisted in stating that the Ericsson propeller was *one angled;* or, as he expressed it, "all the propelling surfaces being of one angle, are unequalized to the different diameters." Now, nothing occurred in the whole discussion in the Herald, that would lead any one having a right understanding of terms, to such a conclusion; writers on mechanics, when speaking of a blade winding spirally round a shaft, designate only the angle formed by the outer edge of the blade; and this our correspondent should have known. And again, J. E. did not even "maintain that 45 degrees [at the outer edge] was the only veritable angle for all propellers;" the discussion on his part was wholly confined to the question as to whether the angle of 45 degrees was better than that of 17½ degrees *for the propellers of the Clarion.* In the Herald of Feb. 22d, he states under his own hand that the plates of the Robert F. Stockton's propellers are placed at an angle of 56½ degrees to the line of the keel. The R. F. Stockton, as our readers probably are aware, is a small tug-boat, fitted with Ericsson's propellers, now plying on the Delaware river.

(4) What one-angled propeller? J. E. has neither constructed nor described such an one.

(5) To this quibble we reply, that the term plane, although not the best, had been very generally used in previous descriptions of this and other propellers; it had received the sanction of custom, and was obnoxious to nothing but hypercriticism.

but we possess sufficient learning to know that no geometrical figure possesses all these properties intact, and ascribed by the editor to the propeller, but the screw.

Now, when this contrivance of "J. E." is thus stripped of the learned verbiage which has been accumulated to cover its nakedness, we see at once it is but a poor contrivance—a mere copy, a bungling copy of a screw—an evasion instead of an invention—and just such a piece of work as a tinker might produce in an attempt to rival an engineer.

It will appear our mistake can have done but little real harm, if another shining light may be credited, if another equally great production of the same school and genus may be believed —for Captain Gardiner has patented in England a propeller which is the exact counterpart of the one we so unwittingly described. For Captain Gardiner's propeller has exactly the same general form and situation, and differs but in one sole respect from that of "J. E." in having the same series of propellers, formed with plane surfaces instead of spiral surfaces; and this construction Capt. Gardiner warrants (with the same disinterested views and love for truth which so distinguishes "J. E.") to excel all other propellers of every possible construction. Now, who can decide when doctors disagree? (6)

We are sorry to have next to notice the disingenuous manner in which the editor attempts to evade or smother our facts where he says he "contents himself with dissenting from our peculiar views upon the immersion of paddle-wheels." (7)

Now, we never gave any views of paddle-wheels at all; but his correspondent 'Mechanicus' did with a vengeance, when he asserted they lost three-fourths of their power by deeper immersion.(8) What we gave were 'facts,' which showed that paddle

(6) **We really cannot see what connection Capt. Gardiner's propeller, even if it be of the form our correspondent chanced to hit upon in his experiments, has with a discussion as to the merits of the Ericsson propeller; nor can we see the force of the conclusions drawn from the inefficiency of the former, nor how it justifies the writer in heaping obloquy upon J. E.**

(7) **This is a forced construction of a passage clear in itself, and saying with all courtesy just what was needed, and no more: the object of our article was to contradict a misstatement, not refute the writer's fallacies.**

(8) **The remarks of 'Mechanicus' related to the *unequal action of paddle-wheels***

wheels gained power by immersion, and we offered to prove the 'fact' by repeating the experiment before any person who might feel any doubt on the subject.

A later experiment proves that Byrne was equally misleading the public mind for private purposes, (at p. 351) by asserting that the Archimedean screw lost so enormously by friction, by pretended or misapprehended quotations from Beaufoy; and this experiment will at the same time show the uselessness and quackery of "J. E.'s" assertion that an angle of 45 degrees was peculiarly required for a propeller (as we are now told in a second edition, for the external edges only of all propellers.)

We tested the efficiency of an Archimedean screw of only 12.5 degrees inclination against the efficiency of a genuine eight armed Ericssonian with spherical surfaces, the outer edges of which were formed at an angle of 45 degrees, each urged by the same precise force, and we found the Archimedean screw the most effective of the two; and therefore the great, the immense loss, that Byrne ascribed to friction is in this case a mere fiction, got up for display and effect, to hide the nakedness of the Ericsson propeller, just like the drapery of a child on its wooden doll.(9)

To show that we were not singular in our opinion of Byrne's praises of "J. E.'s" mighty production, we annex a review of Byrne's pamphlet, from the London Atheneum for June; and in conclusion remark, that we intend soon to give our 'peculiar views' not only of the advantages, but disadvantages also, of propellers, the latter having hitherto been either, unseen, neglected, or studiously concealed.

The following is the review of Byrne's "Observations on the best means of propelling Ships," alluded to above:—

"One of the many pieces of quackery issuing from the press

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during a gale, and the consequent diminution in *effective force* of the engine to propel the ship. The 'facts' related by our correspondent are not an analogous case.

(9) The loss ascribed to friction, it was stated, occurs when the Archimedean screw is applied practically, and it arises from the multiplied gearing then necessary. The writer's experiment, as here imperfectly stated of course, proves nothing, unless we take his *ipse dixit;* but his former blunder has destroyed the confidence necessary for that, and we cannot but believe that, had he seen fit to give us the particulars, it would be discovered, as before, some important point was overlooked.

in swarms, which, under the disguise of mechanical treatises or scientific discussions, are in reality nothing more than the advertisement of some patent in which the advertiser takes an interest. We have in this the usual number of statements wanting facts, and of assertions without arguments; the burden of the tale being that a particular species of spiral propeller is the best possible, and that the Archimedean screw, of which it is a mere modification, is the worst possible. The author frequently abstains from mathematical investigation in courtesy to the presumed ignorance of the reader, who, on the other hand, may be consoled for the loss by the consideration that most ordinary scholars are better mathematicians and sounder mechanicians than the author of this treatise.

"It is much to be regretted that the prevalent mechanical taste should be abused to the purpose of imposing on the public an incessant deluge of 'reports' and 'observations,' in which the writer's aim is to tell only that small portion of truth or of error which may seem to favor his interested views."(10) † †

[We dislike the principle of volunteering a disclaimer, but in the present case one seems imperatively called for; so we have to state without reservation, that maugre the mock-heroic admission in our prefatory remarks, we feel no greater favor or affection for the Ericsson propeller than for any other invention of equal merit: nor were our remarks in defense of it in any degree instigated or tinged by feelings inimical to our correspondent, for whom we feel personally very great respect. Had we inserted his communication, with all its injurious features, of character traduced, motives impugned, and misrepresentations—almost systematic we were about to say, for there are several minor ones relating to persons and matters that it was unnecessary to contradict—and not applied the antidote, we should have been justly chargeable as an abettor in the violation of justice.]

(10) This is the whole of the notice—or *review*, as our correspondent chooses to dignify it—and more unjust or illiberal it could not well be. So far from avoiding mathematical investigation, Mr. Byrne bases upon it almost his entire argument. True, he has abstained, and very properly we think, from algebraic formulæ. His 'Observations' were written to be comprehended by readers generally, and not by merely the scientific portion of them.

MISCELLANEOUS.

FOREIGN.

The Rock Harmonicon.—We have previously noticed the invention of a musical instrument composed of different stones, which produced very melodious tones; and we perceive by statements now published in the daily papers, that the instrument has been at length brought to perfection. The following is the description given of it:—This very extraordinary musical instrument consists of rough stones collected in the immediate neighborhood of Skiddaw. The stones, the longest of which is 4½ feet in length, about 1½ inch in thickness, and about 3 inches in breadth, and the shortest of which is about 6 inches long, ½ an inch thick, and 1 inch broad, are placed across a pair of wooden bars covered with twisted straw, and form the keys. These are struck by wooden hammers, and emit very melodious sounds. The power of the instrument extends to a compass of 5½ octaves, accompanied by all the semitones. Three sons of Mr. J. Richardson, the inventor, perform on the instrument, and produce most beautiful and surprising effects, from what at first sight appears a rough and uncouth assemblage of transverse bars of stone. The inventor was upwards of 13 years almost incessantly employed in bringing his invention to perfection, and it certainly does, in its present state, produce tones of the richest harmony, full of sweetness, and of the most delicate modulation. It is an ingenious invention, and is deserving of public patronage. The inventor has appealed to the opinion of several eminent musical men, and they have all expressed their delight. Sir George Smart, a very competent judge in such a case, has declared his high satisfaction with the result of this invention.

Inventors' Adv.

Removal of Sunderland Lighthouse.—At a late meeting of the commissioners of the river Wear, the taking down of the lighthouse being discussed, as part of the plan of building the new north pier at the mouth of the harbor, Mr. Murray, the engineer, suggested the removal of the lighthouse, in its present entire state, to the eastern extremity of the new pier, a distance of about 420 feet, so as to make it serve the double purpose of a stationary and a tide light. Mr. Murray exhibited a model of the building, and after explaining how he proposed to effect this undertaking, the board decided that he should proceed forthwith to remove it. This lighthouse was erected about forty years ago, by the late Mr. Pickernell, then engineer to the harbor commissioners. It is wholly composed of stone; its form is octagonal, 15 feet in breadth across its base, 62 feet in height from the surface of the pier to the top of the cornice, where it is 9 feet in breadth across, and the top of the dome is 16 feet above the cornice, making a total height of 78 feet, and its calculated weight is 250 tons. Mr. Murray intends to cut through the masonry near its foundation, and insert whole timbers, one after another, through the building, and extended 7 feet beyond it. Above and at

right angles to them, another tier of timbers is to be inserted in like manner, so as to make the cradle or base a square of 29 feet; and this cradle is to be supported upon bearers, with about 250 wheels of six inches diameter, intended to traverse on six lines of railway to be laid on the new pier for that purpose. The shaft of the lighthouse is to be tied together with bands, and its eight sides are to be supported with timber braces from the cradle upwards to the cornice. The cradle is to be drawn and pushed forward by powerful screws along the railways above mentioned, on the principle of Morton's patent slip for the repairing of vessels. However surprising the removal of such a building may appear to many, yet in New-York for some years past large houses have been removed from their original situation to a considerable distance without sustaining any injury. The immense block of granite, serving as the pedestal of the equestrian statue of Peter the Great, at St. Petersburgh, was conveyed four miles by land and 13 by water. Several obelisks have likewise been transported, at different times, from Egypt to Europe; and lately, one was conveyed from Thebes, and erected by the French at Paris. But the fact that the lighthouse on our north pier is composed of stones of comparatively small dimensions, its great height, and small base, make the operation of removing it much more difficult than anything of the sort ever attempted. We heartily wish the enterprising engineer every success in his bold and novel undertaking, which is to be carried into execution in the course of a few weeks. Sunderland Herald.

Painting with Colorless Fluids.—At a recent conversazione of the Society of British Artists, Mr. Stephens, of Stamford-street, exhibited a novel kind of experiment, peculiarly interesting to artists. He showed the possibility of painting colored drawings (without using any visible color) by the effect of chemical combination; in other words, the colors were developed in the process of painting from the liquids used. Colorless liquids were applied to the surface, and by using them successively, and combining them with due reference to their chemical qualities of producing particular colors, a very novel and striking effect was produced. Mr. Stephens clearly demonstrated the possibility of painting pictures by this novel method, and one advantage attending its adoption would be, that the colors not being produced until they had entered into combination with and dyed the texture of the fabric operated upon, the picture would not be liable to erasure by friction, as when precipitated colors only (as in the ordinary method of painting) are used. Of course a very minute acquaintance with the chemical nature of colors, and the combinations of which they are susceptible, would be necessary to the artist who would wish to execute with success this novel style of painting. Mech. Mag.

Franklin's Printing Press.—Mr. Harrild, of 11 Great Distaff-lane, Friday-street, Cheapside, has the identical printing press at which Dr. Franklin worked when a journeyman printer in London. It is made mostly of wood; had a bed of stone, instead of iron, on which the types were placed. It has a copper plate fixed on it, with an inscription setting forth its history; and goes on to state that, forty years after the

Doctor worked at the press, he revisited London on a political mission, and went to the office where this press was, and stated to the men using it that forty years before he had worked at the same press—and treated them with beer. Ib.

Remarks on Animalcules.—These creatures, the smallest with which we are acquainted, are called *animalcules of infusion.* They are thus named because they are produced in infusions and are such diminutive animals. For their production, nothing more is required than to pour water on any animal or vegetable substance, and let this infusion stand four or five days in a moderately warm room, when a species of fermentation will take place in the liquor; a slimy skin will grow over it, and an immense multitude of these animalcules, visible only by means of the magnifying glass, will be found in the fluid. They may be obtained from different vegetable substances; but from some more, from others less. Of the numerous infusions, however, with which experiments have been made, none have afforded such multitudes as thyme. If you put as much thyme as may be taken up between the ends of the thumb and two fingers into a wine-glass, fill the glass with pure water, and let it stand for four days, you will be truly astonished when you look at a drop of it through the microscope; millions of animalcules swim about, and the celerity of their motion is so great that it makes the eye almost giddy. The usual form of the animalcules, when at rest appears to be spherical, or a little longish, or egg shaped. When they are in motion, their bodies are more or less elongated, accordingly as they swim about with more or less celerity. Some are seen darting along with great swiftness, the figure of which is nearly linear or resembling that of a small worm. Nothing can be conceived more lively; the bustle of a nest of ants, or swarm of gnats, is sluggishness to it. They dart in all directions, like an arrow from a bow, across the field of the microscope, in straight lines, when their bodies are drawn out greatly in length. Sometimes they conceal themselves under the slime of the liquor, as if they were seeking their nutriment there; then they reäppear, swimming in various directions, and dexterously passing each other when they meet. Sometimes they draw their bodies up together in a spherical form and then stretch them out again, in the same manner as a leech. Now they appear to dive down towards the bottom of the drop, as only their hinder parts are visible; presently they spin round like a top, with incredible velocity. When one of these animalcules has entangled himself in a particle of slime, it is pleasing to see how he whirls himself round with it in order to extricate himself. It is equally pleasing to observe the motions which they frequently make with the head or pointed fore end: when they give themselves a spring to dart forward, they frequently turn the head quickly on one side, as if they were biting at something, and swim forward with the head in this oblique direction.

Curious readers will ask, how big the largest of these animalcules may be? An idea of their size may be given by observing, that upwards of 200 of the largest may be contained in the space occupied by one of the smallest grains of sand. A little mite is to one of these animalcules much the same as the turkey is to the sparrow.

The longevity of these animalcules cannot easily be ascertained. Those that we contemplate under the microscope do not die a natural death, but are destroyed by the evaporation of the fluid, which leaves thousands of their dead bodies on the glass side, in the shape of a little, scarcely perceptible dust. It is observable, that in an infusion that has stood a week or more they become smaller, and at length seem to disappear; whether, however, these smaller animalcules are the same which have gradually diminished in size, or whether they are a more diminutive species which at last alone remains, cannot be ascertained.

Mavor.

To fix Drawings in Chalk and Crayons.—The Marquis de Varennes has recently discovered a method, which is equally simple and ingenious, of giving to drawings in pencil and crayons the fixidity of painting, and without injury. He succeeded in obtaining this result by varnishing them on the back, that is, by spreading over the back of the paper an alcoholic solution of white gum-lac. This solution quickly penetrates the paper, and enters even into the marks of the crayon on the other side. The alcohol quickly evaporates, so that in an instant all the light dust from the crayons and chalk, which resembles that on the wings of a butterfly, adheres so firmly to the paper that the drawing may be rubbed and carried about without the least particle being effaced. Such is the process invented by M. Varennes; the following are the accurate proportions of the solution:—Ten grammes of common gum-lac are dissolved in a hundred and twenty grammes of alcohol; the liquid is afterwards bleached with animal charcoal. For the same purpose may be used even the ready-made paint that can be purchased at the color shops, containing a sixth of white lac, and adding two thirds of rectified spirits of wine. After it has been filtered, there is nothing further to be done than to spread a layer of either of these solutions at the back of the drawings, in order to give them the solidity required. Moniteur Industriel.

Mortar for Chimneys.—The fact cannot be too generally known, that if, when a chimney is built, the mortar with which it is to be plastered be mixed with salt, there will be no necessity for sweeping it, as in every damp spell of weather the salt deliquesces, and the soot will of course fall down. Lond. Sat. Jour.

Insects in Chalk.—Professor Ehrenberg has made some remarkable discoveries in the course of his various experiments on chalk. He found that a cubic inch possessed upwards of a million of microscopical animalculæ; consequently a pound weight of chalk contains above ten million of these animalculæ! From his researches it appears probable that all the strata of chalk in Europe are the product of microscopical animalculæ, most of them invisible to the naked eye. Ib.

Caterpillar Weavers.—A number of years ago, M. Habenstreet, of Munich, an old officer, amused himself by directing the labor of caterpillars, and succeeded in producing an entirely new and curious kind of fabric. These caterpillars are the larvæ of a butterfly known by the name of *finea punctata*, or, according to other naturalists, *finea padilla.* Their instinct leads them to construct above themselves a covering of

extreme fineness, but, nevertheless, firm enough to be impenetrable by air, which covering can be easily detached from them. The inventor made these insects work on a suspended paper model, to which he gave exactly the form and size which he required. He thus obtained, at pleasure, among other articles, square shawls, of the dimensions of an ell; shawls two ells in length and one in width; an aërostatic balloon, four feet high by two in horizontal diameter; a lady's entire dress, with sleeves, but without seam. When he wished to give to the fabric any prescribed shape, all that he found necessary was to touch the limits which ought not to be passed with oil, for which the caterpillars have a natural repugnance so strong that they will not come in contact with it. The fabric, although perfectly consistent, supassed the finest cambric in lightness. The balloon which we have mentioned weighed less than five grains. The warmth of the hand was sufficient instantly to inflate it; and the flame of a single match held under it for a few seconds was enough to raise it for a considerable height, whence it would not descend for half an hour. When a shawl of the size of a square ell had been well stretched, it was blown into the air by means of a small pair of bellows, and then resembled a light smoke, subject to the slightest agitation of the atmosphere.

Flexible Ivory.—It has been long known that in subjecting bones to the action of hydrochloric acid, the phosphate of lime which forms one of their component parts is extracted. Bones preserved in this manner retain their original form and acquire great flexibility. It is by this process that M. Charriere, a skilful maker of surgical instruments in Paris, softens the ivory of which he makes use to manufacture flexible tubes, probes, and other instruments. These pieces, after receiving the required form and polish, are steeped either entirely or partially in acid diluted with water, where they remain as long as required. The ivory, after having undergone this preparation, becomes supple, flexible, elastic, and assumes rather a yellowish color. In the course of drying it again becomes hard and inflexible; but the flexibility of the ivory may be restored by wetting, either by surrounding it with a piece of wet linen, or by placing sponge in the cavities of the pieces. Some pieces of ivory have been kept in a flexible state in the acidulated water for eight days; they were neither changed nor injured, nor too much softened; they had acquired no taste nor any disagreeable smell. With respect to the excellence of the articles thus manufactured by M. Charriere, it may be observed that they have been examined by competent judges, and approved by the Royal Academy of Medicine. The preparation of flexible ivory may give rise to various useful applications of it in the arts or in manufactures. Inventors' Adv.

Manual Excavating Machine.—We last week translated from the Moniteur Industriel an account of a locomotive excavator worked by steam; we now take from the same paper the following account of an excavating machine worked by hand:—" M. Labbé is an ingenious mechanician whose creative mind grasps the most difficult undertakings, though at the risk of failure. It is known that men of this description are usually little appreciated, though they lead the way to new disco-

veries, and though it is to them we are indebted for almost everything that we know. M. Labbé has just invented and constructed a new machine for excavating, that is, an apparatus by means of which the soil, in whatever situation, may be raised 10, 15 or even 20 metres with the greatest facility, and with a great saving of power. The soil may be lifted up to that height, and thence conveyed wherever it is required. We will endeavor to explain the mode of its operation. In the first place, four or five wagons or boxes, attached by an endless chain, run on a horizontal railway in the form of an ellipsis. This chain is put in action by two men, by means of a handle ingeniously contrived. These boxes, in passing under a hopper on which the earth is thrown that is to be raised, are laden alternately by opening a trap door. As soon as they are laden, they proceed in a circular line round half the ellipsis, and arrive in succession just above other boxes, into which by a very simple mechanism they deposit their contents. These other boxes, by means of an endless chain in the manner before described, and connected with the first, are raised in succession to the height required. When they have reached it, the earth which has been raised can be thrown down with the greatest ease, or conveyed into any other place. The whole apparatus is supported on small wheels, and advances or is drawn back at will, as necessity requires. It will be perceived that the first idea of M. Labbé's machine is simple, rational, and entirely adapted to the object to be obtained. But surprise and astonishment is not so much excited by the first idea as by the details, by the number of small mechanical problems that it has been necessary to solve in order to combine and to bring into operation the endless chains, the boxes, and the wheels of the wagons, to effect the different operations, the loading and the unloading, the raising of the earth—and all accomplished by two men turning a handle. We do not hesitate to say, that all experienced men, on seeing this machine in operation and on studying its mechanism, will agree that its inventor has taken everything into consideration, and that to have accomplished what he has it was not only necessary to be acquainted with everything that had been done previously, but also to be able to imagine and to carry into execution all the requisites for giving effect to the original idea. Many statements have been made of the great saving of expense which would result from the use of the *Terrassier Labbé* in the construction of canals, the fortifications of Paris, &c. &c. We shall not enumerate them, not being able to test their accuracy. All that we are able to announce is, that from the experiments which we have witnessed, we are much disposed to think that the machine of M. Labbé will be of very great service." Ib.

New process for hardening Plaster.—Messrs. Greenwood & Savage have succeeded in communicating to plaster the hardness of a good calcareous stone. Pulverized gypsum, prepared according to their process, is used with success either in castings or as plaster. We have seen two small casts very well executed, and which demonstrate that notwithstanding this plaster becomes so hard when dry, it can easily be moulded when it is wet. Messrs. Greenwood & Savage have erected a manufactory at Alford, which is at the present time in active operation. The following is the method of fabrication :—The plaster is first dried

in a kiln, in order to disperse the water of crystallization. It is afterwards thrown into an aqueous bath saturated with alum; there it remains for about six hours; it is then exposed to the open air till it becomes dry. In this state it is taken to the kiln to be heated a second time, which operation is not completed till the plaster becomes of a red brown color. All the operations are then finished. When the plaster has undergone this process, it is immediately taken to the mill to be pulverized; it is then put into casks, ready for sale. In using this plaster, it is mixed like common plaster, and it is applied to the surfaces prepared for its reception, particular care being taken that they are previously moistened. The hardening takes place in the course of a few hours. It adheres strongly to wood, stone, iron, plaster, &c. Mixed with an equal quantity of sand, it acquires strong adhesive resisting properties. Ib.

Manufacture of Platinum.—A correspondent suggests that the price of that necessary article, platinum, might be materially reduced by means of the electrotype process. There is no doubt that the high price of this metal is, in a great measure, due to the labor required in its reduction into a malleable state, by the method of Wollaston; and this portion of the expense (our correspondent is of opinion) might be considerably reduced, if the metal were at once reduced from its solution by the slow action of electricity—this mode involving no labor, while the necessary apparatus is cheap. The same method, it is further suggested, could also be applied to reduce nickel to a malleable state; and this being a cheap metal, and not liable to rust, it might be advantageously used for some purposes for which platinum is considered too expensive. Ib.

Zoölogical Curiosity.—The collection of living animals in the Garden of Plants, in Paris, has lately had added to it a specimen never before seen alive in any zoölogical collection of Europe. It is a monitor lizard, from Brazil, three feet in length, two-thirds of which are formed by the tail. The skin has the appearance of black shagreen, spotted with bright yellow. Although possessing great strength, it is harmless and gentle, and frequently darts from its mouth a long forked tongue. Ib.

Rewards for Talent and Virtue.—One of the most interesting exhibitions of Paris has just taken place, viz. the distribution of prizes accorded by the Academie Française for the most useful literary works, and the best instances of moral actions during the past year.

The assembly was held at the Institute, in the beautiful circular hall of the Academie, which is arranged like an amphitheatre, with benches of green velvet; the galleries are divided by four statues of Bossuet, Fenelon, Descartes, and Sully, and the ceiling terminates in a highly wrought dome. There were about 60 members of the Academy present, most of whom wore their costume, which is like the English civilian court dress: the coat is black, profusely embroidered with green leaves.

An interesting detail was first read by the Secretary, relative to the nature of the literary productions which were to be rewarded, and he

ended by announcing that the prize for poetry (1500 francs) on the given theme, "The influence of Christian civilization in the East," had been gained by M. Alfred des Essarts, who would read his poem to the audience.

The young author was then led up to the President, from whom he received a rich gold medal; and, amidst warm plaudits from the members, he read aloud his manuscript.

A prize of 5000 francs was given to M. Reybaud, for a work refuting the socialist systems of St. Simon, Fourier, and Robert Owen.

Of the eight prizes for works most useful to morality, six were to female writers, who, as the Secretary gallantly said, had united elegance with power, and purity with industry. Among the translations, Baroness Carlowitz received 2000f. for a translation of Klopstock's Messiah.

When the literary rewards were terminated, the prizes for virtuous actions were detailed by the Directeur, M. de Jouy, who is so well known in England by his "Hermit of the Chaussée d'Antin," published many years ago. A sum of 10,000f. (£400) was given among four persons for praiseworthy acts: The first prize, of 3000f. to a poor washerwoman, who, although she had seven children of her own, had adopted eight orphans fifteen years ago, and had maintained them through many struggles and difficulties ever since. Another prize was to an officer who had saved the life of a child from a burning house which no one else would enter; and, after his first escape, hearing a female voice from the second floor exclaiming "O save my daughter!" regardless of the fearful danger, the young man rushed up a ladder, and found his difficulties increased by the mother and daughter having fainted; however, by almost superhuman exertion, he saved both, at the expense of severe personal injury to himself.

A further sum of 10,000f. was given in smaller portions, for instances of virtue and domestic good conduct in humble life, the parties residing in the provinces. The meeting terminated with the announcement of the prize themes for the ensuing year, and likewise the grand prize to be awarded in 1844, viz. "10,000 francs for the best five-act tragedy or comedy, in verse, by a Frenchman, printed and performed in France, which shall be moral and applauded." The members of the French Academy are alone excluded from trying to gain the prize. 6000f. will be given among the translators of the most useful ancient or modern works during the half year; and finally, the sum of 1500f. "to assist a young writer, or poor artist, whose talent deserves encouragement, to pursue the career of letters or the fine arts." Ib.

Purifying Oils &c. by Steam.—This invention consists in a mode of purifying animal, vegetable and mineral oils, fats and tallows, by passing a supply of high pressure steam (divided into small currents by passing through a perforated metal plate) through them, when the same are enclosed in close vessels and subjected to the compressure and temperature due to such high pressure steam. The steam, after having passed through the oils, &c. makes its escape through loaded safety-valves, as waste steam, carrying away with it those volatile impure portions of the oil, &c. which gave an offensive smell thereto.

The waste steam after passing through the safety-valves is collected,

cooled and condensed, in order that the volatile impure portions of the oils, &c. may be collected for such uses as they may be fit for. The oils, fats and tallows remaining in the close vessels after the process, will be left in a purified state, and only require to be drawn off from the same, cooled and separated from the water resulting from the steam, and then filtered, in order to become fit for sale or use. Ib.

New Mode of preserving Animal and Vegetable Substances.—The substances to be preserved, having been first scalded, are put into vessels or cases of tin of a cylindrical or other convenient form, hermetically closed, a small space being left in each, to allow for the swelling of the substances. A number of these vessels are placed in a large boiler and covered with water, and the boiler being closed, the water is made to boil, retaining it at about 212° Fahrenheit; for animal matters, the boiling is continued for two hours and a half, and for vegetable matters from fifteen to twenty-five minutes. After boiling the proper time, the vessels are taken out of the boiler, and if on examination they show no unsoundness, they are placed in a hot sand-bath, or other convenient means of applying heat, leaving the upper ends of the vessels uncovered: in the upper end of each a minute hole is made, and the heat being kept up above 212° Fahrenheit, the air in the case or vessel will be driven out with the steam. When the steam flows out freely, and whilst it is flowing out, the hole is closed by a soldering iron; the operation is then complete. Ib

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Improvement in Carding Engines.—From the endless feeding cloth or apron, the wool is received on to a feeding roller covered with cards, placed at one end of the apron, and is guided over part of the periphery of the same by a curved guide; it is then caught by the cards of the main carding cylinder and carried upwards, the lower edge of the curved guide acting as a detainer to the wool, and consequently causing the main carding cylinder (which revolves faster, and in a contrary direction to the feeding roller) to separate the fibres of the same. Ib.

Proposed Mode of proving Suspension Bridges.—It is nearly three years since we announced a method of proving suspension bridges without endangering any one. This method has at various intervals been alluded to by other journals. All this has been of no use either to the administration, which does not read journals, nor to the engineers, who laugh at them. A bridge over the Charente, with pavement, has just fallen, and killed M. Gow, its projector. The rational method that we have proposed is, that the road-way of the bridge should be covered with empty casks with the bungholes uppermost; a long trough or tin or leather pipe should be placed over the whole range, with small branch tubes, to enter each bunghole. The water should be pumped from the river, which, without any further trouble, would fill all the casks; the weight of which might be accurately calculated. All this might be done without any of those sudden shocks which occasion a fracture when the maximum weight is put on, and if our plan had been adopted, the engineer in the case of the bridge over the Charente would have saved his life. Le Fanal.

Oddities of Great Men.—The greatest men are often affected with the most trivial circumstances, which have no apparent connection with the effects they produce. A gentleman of considerable celebrity always feels secure against the cramp, when he places his shoes, on going to bed, so that the right shoe is on the left of the left shoe, and the toe of the right next to the heel of the left. Dr. Johnson used always, on going up Bolt Court, to put one foot upon each stone of the pavement; if he failed, he felt certain the day would be unlucky. Buffon, the celebrated naturalist, never wrote but in full dress. Dr. Routh, of Oxford, studied in full canonicals. An eminent living writer can never compose with his slippers on. A celebrated preacher of the last century could never make a sermon with his garters on. A great German scholar writes with his braces off. Reiseg, the German critic, wrote his commentaries on Sophocles with a pot of porter by his side. Schlegel, at the age of 72, lectures extempore, in Latin, with his snuff-box constantly in his hand; without it he could not get on. Lond. Sat. Jour.

Astronomical Intelligence.—The Munich Gazette publishes a note from Professor Gruithuisen, announcing that he had ascertained the exact time in which the sun makes its rotation upon its own axis. He finds that the sideral rotation is made in 25 days, 14 hours, 54 minutes and 5 seconds; and its synodic rotation in 27 days, 13 hours, 17 minutes and 19 seconds.

Vegetable Cloth.—The Brussels *Fanal*, which has been very vehement in asserting the claims of Sebastian Botturi as the original inventor of felted cloth, says that he has succeeded in manufacturing cloth from vegetables. "This morning," says the Fanal of June 26, "at break of day, Sebastian Botturi, of Brescia, the real inventor of felted cloth, entered our office, and, in the same tone of voice as Archimedes may be supposed to have exclaimed *Eureka*, he called out, *Ecco! l'ho trovato—panne senza lana* —cloth without wool—and he unfolded a small piece of it. It required close examination to ascertain the reality of his assertion, for this vegetable cloth closely resembled ordinary cloth, and it possesses the advantage of not costing more than from 70 to 75 centimes the square metre."

Improved Mode of Sizing Paper.—This invention consists in the sizing of paper continuously, by unwinding a scroll of dried paper from a reel or roll of ordinary dimensions, and conducting the paper through heated size of the ordinary strength, and after pressing out the superfluous size, rewinding the same paper on to another reel, the whole being performed in an air-tight vessel partially exhausted of air.

A vessel of cast iron is provided with a flange round the top, having a cross-bar with a wide upper surface across the centre of the same; it has two semi-circular lids, which are hinged to the flange, and meet upon the cross-bar, their joints being made air-tight, and in making use of this vessel it is partially exhausted of air. In the upper part of the vessel on each side of the cross-bar a reel is placed, on one of which the dried paper to be sized is wound. From that reel the paper is led down below a guide roll at that end of the vessel, (which is partially immersed in the size contained in the bottom of the same) and is carried

horizontally through the size to a similar guide roll at the other end of the vessel; after passing under which, it is led up through a pair of press rollers, and the end of it is secured to the other reel. Under the vessel is an enclosed space, into which steam or hot water is introduced as required for raising the temperature of the size.

Suitable movements being communicated to the above, the paper will be gradually unwound from one reel, and after passing through the size and being pressed will be wound on to the other reel. Inventors' Adv.

DOMESTIC.

Effects produced on an Idiot's mind by habits of intercourse with a young Girl.—In the course of conversation, a case was mentioned to me as having occurred in the experience of a highly respectable physician, and which was so fully authenticated that I entertain no doubt of its truth. The physician alluded to had a patient, a young man, who was almost idiotic, from the suppression of all his faculties. He never spoke, and never moved voluntarily, but sat habitually with his hand shading his eyes. The physician sent him to walk as a remedial measure. In the neighborhood, a beautiful young girl of sixteen lived with her parents, and used to see the young man in his walks, and spoke kindly to him. For sometime he took no notice of her; but, after meeting her for several months, he began to look for her, and to feel disappointed if she did not appear. He became so much interested that he directed his steps voluntarily to her father's cottage, and gave her bouquets of flowers. By degrees he conversed with her through the window. His mental faculties were roused; the dawn of convalescence appeared. The girl was virtuous, intelligent and lovely, and encouraged his visits when she was told she was benefiting his mental health. She asked him if he could read and write? He answered no. She wrote some lines to him to induce him to learn. This had the desired effect. He applied himself to study, and soon wrote good and sensible letters to her. He recovered his reason. She was married to a young man in a neighboring city. Great fears were entertained that this event would undo the good which she had accomplished. The young patient sustained a severe shock, but his mind did not sink under it; he acquiesced in the propriety of her choice, continued to improve, and at last was restored to his family cured. She had a child, and was soon after brought to the same hospital perfectly insane. The young man heard of this event, and was exceedingly anxious to see her; but an interview was denied to him, both on her account and his own. She died. He continued well, and became an active member of society. What a beautiful romance might be founded on this narrative!

Combe's Notes on the U. S.

Close Calculation.—The St. Louis Gazette goes into a calculation to show the amount of tobacco a man chews in a lifetime. The editor says: "Suppose a tobacco chewer is addicted to the habit of chewing fifty years of his life; each day of that time he consumes two inches of solid plug, which amounts to 6375 feet, making nearly 1¼ mile in length

of solid tobacco, half an inch thick and two inches broad." He wants to know what a young beginner would think if he had the whole amount sketched out before him, and he were told that to chew it up would be one of the exercises of his life, and also that it would tax his income to the amount of $1095? We guess he would think it a pretty considerable of a job. N. Y. Evening Post.

Terrible Volcanic Eruption at the Sandwich Islands.—In the Missionary Herald for July is a letter from Rev. Titus Coan, one of the missionaries of the American Board, containing the following vivid sketch of the late volcanic eruption in Kilauea, one of the Sandwich Islands. The exceedingly interesting facts it details, and the graphic descriptions of the author, will compare with Pliny's celebrated account of the great Vesuvian eruption, A. D. 79, which overwhelmed the cities of Pompeii and Herculaneum; but although not marked like that event by deep and painful consequences to the human race, the narrative of one of the sublimest of nature's displays is worthy of enduring record.

Though my letter is already long, I cannot close it without saying a word respecting the late volcanic eruption in Puna, on this island. At the time this eruption took place we were all absent from Hilo, to attend the general meeting at Oahu, a circumstance which I much regret, as it deprived us of a view of the most splendid and awful part of the scene. Since our return from Oahu, I have made a pretty thorough exploration of the tract of country where the eruption occurred, having found its source, and traced the stream through most of its windings to the sea. Some of the principal facts which have been collected from credible testimony and from personal observation I will now give you. For several years past the great crater of Kilauea has been rapidly filling up by the rising of the superincumbent crust and by the frequent gushing forth of the molten sea below. In this manner the great basin below the black ledge, which had been computed from 300 to 500 feet deep, was long since filled up by the ejection and cooling of successive masses of the fiery fluid. These silent eruptions continued to occur at intervals, until the black ledge was repeatedly overflowed, each cooling, and forming a new layer from two feet thick and upwards, until the whole area of the crater was filled up at least 50 feet above the original black ledge, and thus reducing the whole depth of the crater to less than 900 feet. This process of filling up continued till the latter part of May, 1840, when, as many natives testify, the whole area of the crater became one entire sea of ignifluous matter, raging like old ocean when lashed into fury by a tempest. For several days the fire raged with fearful intensity, exhibiting a scene awfully terrific. The infuriated waves sent up infernal sounds, and dashed with such maddening energy against the sides of the awful caldron as to shake the solid earth above, and to detach huge masses of overhanging rocks, which, leaving their ancient beds, plunged into the fiery gulf below. So terrific was the scene that no one dared to approach near it, and travelers on the main road, which lay along the verge of the crater, feeling the ground

tremble beneath their feet, fled and passed by at a distance. I should be inclined to discredit these statements of the natives, had I not since been to Kilauea and examined it minutely with these reports in view. Every appearance of the crater, however, confirms these reports. Everything within the caldron is new. Not a particle of lava remains as it was when I last visited it. All has been melted down and recast. All is new. The whole appears like a raging sea, whose waves had been suddenly solidified while in the most violent agitation.

Having stated something of the appearance of the great crater, for several days previous to the disgorgement of its fiery contents, I will now give a short history of the eruption itself. I say short, because it would require a volume to give a full and minute detail of all the facts in the case.

On the 30th of May the people of Puna observed the appearance of smoke and fire in the interior, a mountainous and desolate region of that district. Thinking that the fire might be the burning of some jungle, they took little notice of it until the next day, Sabbath, when the meetings in the different villages were thrown into confusion by sudden and grand exhibitions of fire, on a scale so large and fearful as to leave them no room to doubt the cause of the phenomenon. The fire augmented during the day and night, but it did not seem to flow off rapidly in any direction. All were in consternation, as it was expected that the molten flood would pour itself down from its height of 4000 feet to the coast, and no one knew to what point it would flow, or what devastation would attend its fiery course. On Monday, June 1st, the stream began to flow off in a northeasterly direction, and on the following Wednesday, June 3d, at evening, the burning river reached the sea, having averaged about half a mile an hour in its progress. The rapidity of the flow was very unequal, being modified by the inequalities of the surface over which the stream passed. Sometimes it is supposed to have moved five miles an hour, and at other times, owing to obstructions, making no apparent progress, except in filling up deep valleys, and in swelling over or breaking away hills and precipices.

But I will return to the source of the eruption. This is in a forest, and in the bottom of an ancient wooded crater about 400 feet deep, and probably eight miles from Kilauea. The region being uninhabited and covered with a thicket, it was sometime before the place was discovered; and up to this time, though several foreigners have attempted it, no one except myself has reached the spot. From Kilauea to this place the lava flows in a subterranean gallery, probably at the depth of a thousand feet; but its course can be distinctly traced all the way, by the rending of the crust of the earth into innumerable fissures, and by the emission of smoke, steam, and gases. The eruption in this old crater is small, and from this place the stream disappears again for the distance of a mile or two, when the lava again gushed up and spread over an area of about fifty acres. Again it passes under ground for two or three miles, when it reäppears in another old wooded crater, consuming the forest, and partly filling up the basin. Once more it disappears, and flowing in a subterranean channel, cracks and breaks the earth, opening fissures from 6 inches to 10 or 12 feet in width, and sometimes splitting the trunk of a tree so exactly that its legs stand astride at the fissure.

At some places it is impossible to trace the subterranean stream, on account of the impenetrable thicket under which it passes. After flowing under ground several miles, perhaps six or eight, it again broke out like an overwhelming flood, and sweeping forest, hamlet, plantation, and everything before it, rolled down with resistless energy to the sea, where, leaping a precipice of 40 or 50 feet, it poured itself in one vast cataract of fire into the deep below, with loud detonations, fearful hissings, and a thousand unearthly and indescribable sounds. Imagine to yourself a river of fused minerals of the breadth and depth of Niagara, and of a deep gory red, falling in one emblazoned sheet, one raging torrent into the ocean! The scene, as described by eye witnesses, was terribly sublime. Two mighty agencies in collision! Two antagonist and gigantic forces in contact, and producing effects on a scale inconceivably grand! The atmosphere in all directions was filled with ashes, spray, gases, &c.; while the burning lava, as it fell into the water, was shivered into millions of minute particles, and, being thrown back into the air, fell in showers of sand on all the surrounding country. The coast was extended into the sea for a quarter of a mile, and a pretty sand-beach and a new cape were formed. Three hills of scoria and sand were also formed in the sea, the lowest about 200 feet, and the highest about 300.

For three weeks this terrific river disgorged itself into the sea with little abatement. Multitudes of fishes were killed, and the waters of the ocean were heated for twenty miles along the coast. The breadth of the stream where it fell into the sea, is about half a mile, but inland it varies from one to four or five miles in width, conforming itself, like a river, to the face of the country over which it flowed. Indeed, if you can imagine the Mississippi converted into liquid fire, of the consistency of fused iron, and moving onward sometimes rapidly, sometimes sluggishly—now widening into a sea, and anon rushing through a narrow defile—winding its way through mighty forests and ancient solitudes—you will get some idea of the spectacle here exhibited. The depth of the stream will probably vary from 10 to 200 feet, according to the inequalities of the surface over which it passed. During the flow, night was converted into day on all Eastern Hawaii. The light rose and spread like the morning upon the mountains, and its glare was seen on the opposite side of the island. It was also distinctly visible for more than 100 miles at sea, and at the distance of 40 miles fine print could be read at midnight. The brilliancy of the light was like a blazing firmament, and the scene is said to have been one of unrivaled sublimity.

The whole course of the stream from Kilauea to the sea is about 40 miles. Its mouth is about 25 miles from Hilo station. The ground over which it flowed descends at the rate of 100 feet to the mile. The crust is now cooled, and may be traversed with care, though scalding steam, pungent gases and smoke are still emitted in many places.

In pursuing my way for nearly two days over this mighty smouldering mass, I was more and more impressed at every step with the wonderful scene. Hills had been melted down like wax; ravines and deep valleys had been filled; and majestic forests had disappeared like a feather in the flames. In some places the molten stream parted and flowed in separate channels for a considerable distance, and then re-

uniting, formed islands of various sizes from one to fifty acres, with trees still standing, but seared and blighted by the intense heat. On the outer edges of the lava, where the stream was more shallow and the heat less vehement, and where of course the liquid mass cooled soonest, the trees were mowed down like grass before the scythe, and left charred, crisped, smouldering, and only half consumed. As the lava flowed around the trunks of large trees on the outskirts of the stream, the melted mass stiffened and consolidated before the trunk was consumed; and when this was effected, the top of the tree fell and lay unconsumed on the crust, while the hole which marked the place of the trunk remains almost as smooth and perfect as the calibre of a cannon. These holes are innumerable, and I found them to measure from 10 to 40 feet deep; but, as I remarked before, they are in the more shallow parts of the lava, the trees being entirely consumed where it was deeper. During the flow of this eruption, the great crater of Kilauea sunk about 300 feet, and her fires became nearly extinct, one lake only out of many being left active in this mighty caldron. This, with other facts which have been named, demonstrates that the eruption was the disgorgement of the fires of Kilauea. The open lake in the old crater is at present intensely active, and the fires are increasing, as is evident from the glare visible at our station, and from the testimony of visitors.

During the early part of the eruption, slight and repeated shocks of earthquakes were felt, for several successive days, near the scene of action. These shocks were not noticed at Hilo.

Through the directing hand of a kind Providence no lives were lost, and but little property was consumed during this amazing flood of fiery ruin. The stream passed over an almost uninhabited desert. A few little hamlets were consumed, and a few plantations were destroyed; but the inhabitants, forewarned, fled and escaped. During the progress of the eruption, some of the people in Puna spent most of their time in prayer and religious meetings; some flew in consternation from the face of the all-devouring element; others wandered along its margin, marking with idle curiosity its daily progress; while another class still coolly pursued their usual vocations, unawed by the burning fury as it rolled along within a mile of their doors. It was literally true that they ate, drank, bought, sold, planted, builded, apparently indifferent to the roar of consuming forests, the sight of devouring fire, the startling detonations, the hissing of escaping steam, the rending of the earth, the shivering and melting of gigantic rocks, the raging and dashing of the fiery waves; the bellowings, the murmurings, the unearthly mutterings coming up from a burning deep. They went carelessly on amid the rain of ashes, sand, and fiery scintillations, gazing vacantly on the fearful and ever varying appearance of the atmosphere, murky, black, livid, blazing, the sudden rising of lofty pillars of flame, the upward curling of ten thousand columns of smoke, and their majestic roll in dense, dingy, lurid, or party-colored clouds. All these moving phenomena were regarded by them as the fall of a shower, or the running of a brook; while to others they were as the tokens of a burning world, the departing heavens, and a coming Judge.

I will just remark here, that while the stream was flowing, it might be approached within a few yards on the windward side, while at the

leeward no one could live within the distance of many miles, on account of the smoke, the impregnation of the atmosphere with pungent and deadly gases, and the fiery showers which were constantly descending and destroying all vegetable life. During the progress of the descending stream, it would often fall into some fissure, and forcing itself into apertures, and under massive rocks, and even hillocks and extended plats of ground, and lifting them from their ancient beds, bear them, with all their superincumbent mass of soil, trees, &c. on its viscous and livid bosom, like a raft on the water. When the fused mass was sluggish, it had a gory appearance like clotted blood, and when it was active it resembled fresh and clotted blood mingled and thrown into violent agitation. Sometimes the flowing lava would find a subterranean gallery, diverging at right angles from the main channel, and pressing into it, would flow off unobserved, till meeting with some obstruction in its dark passage, when by its expansive force it would raise the crust of the earth into a dome-hill of 15 or 20 feet in height, and then bursting this shell, pour itself out in a fiery torrent around. A man who was standing at a considerable distance from the main stream, and intensely gazing on the absorbing scene before him, found himself suddenly raised to the height of 10 or 15 feet above the common level around him, and he had but just time to escape from his dangerous position, when the earth opened where he had stood, and a stream of fire gushed out.

[The following paper is derived from the manuscripts deposited among the collections of the Society by the Rev. Samuel Miller, D. D. to whom it was communicated by the Rev. John Heckewelder, for many years a Moravian missionary to the Indians of Pennsylvania. In a letter accompanying it, dated at Bethlehem, January 26th, 1801, Mr. Heckewelder says, "As I receive my information from Indians, in their language and style, I return it in the same way. *Facts* are all I aim at, and from my knowledge of the Indians I do not believe every one's story. The inclosed account is, I believe, as authentic as anything of the kind can be obtained."—*Note by Ed. N. Y. Hist. Coll.*]

Indian Tradition.—The following account of the first arrival of Europeans at York Island, is verbatim as it was related to me by aged and respected Delawares, Monseys, (often written Minsis,) and Mahicanni, (otherwise called Mohigans, Mahicanders,) near forty years ago. It is copied from notes and manuscripts taken on the spot. They say: "A long time ago, when there was no such thing known to the Indians as people with a *white skin*, (their expression,) some Indians who had been out a-fishing, and where the sea widens, espied at a great distance something remarkably large swimming, or floating on the water, and such as they had never seen before. They immediately returning to the shore apprised their countrymen of what they had seen, and pressed them to go out with them and discover what it might be. These together hurried out, and saw to their great surprise the phenomenon, but could not agree what it might be; some concluding

it either to be an uncommon large fish, or other animal, while others were of the opinion it must be some very large house. It was at length agreed among those who were spectators, that as this phenomenon moved towards the land, whether or not it was an animal, or anything that had life in it, it would be well to inform all the Indians on the inhabited islands of what they had seen, and put them on their guard. Accordingly, they sent runners and watermen off to carry the news to their scattered chiefs, that these might send off in every direction for the warriors to come in. These arriving in numbers, and themselves viewing the strange appearance, and that it was actually moving towards them, (the entrance of the river or bay,) concluded it to be a large canoe or house, in which the great Mannitto (great or Supreme Being) *himself* was, and that he probably was coming to visit them. By this time the chiefs of the different tribes were assembled on York Island, and were counselling, or deliberating, on the manner they should receive their Mannitto on his arrival. Every step had been taken to be well provided with a plenty of meat for a sacrifice; the women were required to prepare the best of victuals; idols or images were examined and put in order; and a grand dance was supposed not only to be an agreeable entertainment for the Mannitto, but might, with the addition of a sacrifice, contribute towards appeasing him, in case he was angry with them. The conjurors were also set to work, to determine what the meaning of this phenomenon was, and what the result would be. Both to these, and to the chiefs and wise men of the nation, men, women, and children were looking up for advice and protection. Between hope and fear, and in confusion, a dance commenced. While in this situation fresh runners arrive declaring it a house of various colors, and crowded with living creatures. It now appears to be certain that it is the great Mannitto bringing them some kind of game, such as they had not before; but other runners soon after arriving, declare it a large house of various colors, full of people, yet of quite a different color than they (the Indians) are of; that they were also dressed in a different manner from them, and that one in particular appeared altogether red, which must be the Mannitto himself. They are soon hailed from the vessel, though in a language they do not understand; yet they shout (or yell) in their way. Many are for running off to the woods, but are pressed by others to stay, in order not to give offence to their visiters, who could find them out, and might destroy them. The house (or large canoe, as some will have it,) stops, and a smaller canoe comes ashore with the red man and some others in it; some stay by this canoe to guard it. The chiefs and wise men (or councillors) had composed a large circle, unto which the red-clothed man with two others approach. He salutes them with friendly countenance, and they return the salute after their manner. They are lost in admiration, both as to the color of the skin (of these whites) as also to the manner of their dress, yet most as to the habit of him who wore the red clothes, which shone* with something they could not account for. He *must* be the great Mannitto (Supreme Being,) they think, but why should he have a *white skin?*† A large hockhack‡ is brought forward by one of the (supposed) Man-

* Lace. † Their own expression. ‡ Their word for gourd, bottle, decanter, &c.

nitto's servants, and from this a substance is poured out into a small cup (or glass) and handed to the Mannitto. The (expected) Mannitto drinks, has the glass filled again, and hands it to the chief next to him to drink. The chief receives the glass, but only smelleth at it, and passes it on to the next chief, who does the same. The glass thus passes through the circle without the contents being tasted by any one, and is upon the point of being returned again to the red-clothed man, when one of their number, a spirited man and great warrior, jumps up, harangues the assembly on the impropriety of returning the glass with the contents in it; that the same was handed them by the Mannitto in order that they should drink it, as he himself had done before them; that this would please him; but to return what he had given to them might provoke him, and be the cause of their being destroyed by him; and that, since he believed it for the good of the nation that the contents offered them *should* be drank, and as no one was willing to drink it *he would*, let the consequence be what it would; and that it was better for one man to die, than a whole nation to be destroyed. He then took the glass, and bidding the assembly a farewell, *drank it off*. Every eye was fixed on their resolute companion, to see what an effect this would have upon him; and he soon beginning to stagger about, and at last dropping to the ground, they bemoan him. He falls into a sleep, and they view him as expiring. He awakes again, jumps up, and declares that he never felt himself before so happy as after he had drank the cup: wishes for more: his wish is granted; and the whole assembly soon join him, and become intoxicated.*

After this general intoxication had ceased, (during which time the whites had confined themselves to their vessel) the man with the red clothes returned gaain to them, and distributed presents among them, to wit, beads, axes, hoes, stockings, &c. They say that they had become familiar to each other, and were made to understand by signs; that they now would return home, but would visit them next year again, when they would bring them more presents, and stay with them awhile; but that, as they could not live without eating, they should then want a little land of them to sow some seeds in order to raise herbs to put in their broth. That the vessel arrived the season following, and they were much rejoiced at seeing each other; but that the whites laughed at them (the Indians) seeing they knew not the use of the axes, hoes, &c. they had given them, they having had these hanging to their breasts as ornaments, and the stockings they had made use of as tobacco pouches.

* The Delawares call this place (New-York Island) *Mannahattanink* or *Mannahachtanink* to this day. They have frequently told me that it derived its name from this general *intoxication*, and that the word comprehended the same as to say, *the island or place of general intoxication*.

The Mahicanni, (otherwise called Mohiggans by the English, and Mahicanders by the Low Dutch) call this place by the same name as the Delawares do; yet think it is owing or given in consequence of a kind of wood which grew there, and of which the Indians used to make their bows and arrows. This wood the latter (Mohicanni) call "*gawaak*."

The universal name the Monseys have for New-York, is *Laaphawachking*, which is interpreted, *the place of stringing beads (wampum)*. They say this name was given in consequence of beads being here distributed among them by the Europeans; and that after the European vessel had returned, wherever one looked, one would see the Indians employed in stringing the beads or wampum the whites had given them.

The whites now put handles (or helves) in the former, and cut trees down before their eyes, and dug the ground, and showed them the use of the stockings. Here (say they) a general laughter ensued among them (the Indians) that they had remained for so long a time ignorant of the use of so valuable implements; and had borne with the weight of such heavy metal hanging to their necks for such a length of time. They took every white man they saw for a Mannitto, yet inferior and attendant to the *supreme Mannitto*, to wit, to the one which wore the red and laced clothes. Familiarity daily increasing between them and the whites, the latter now proposed to stay with them, asking them only for so much land as the hide of a bullock would cover (or encompass) which hide was brought forward and spread on the ground before them. That they readily granted this request; whereupon the whites took a knife, and beginning at one place on this hide, cut it up into a rope not thicker than the finger of a little child, so that by the time this hide was cut up, there was a great heap; that this rope was drawn out to a great distance, and then brought round again, so that both ends might meet; that they carefully avoided its breaking, and that upon the whole it encompassed a large piece of ground; that they (the Indians) were surprised at the superior wit of the whites, but did not wish to contend with them about a little land, as they had enough; that they and the whites lived for a long time contentedly together, although these asked from time to time more land of them; and proceeding higher up the Mahicanittuk (Hudson river) they believed they would soon want all their country, and which at this time was already the case."*

Transplanting Trees.—Many trees are lost by setting them *too deep* in their new bed. There is a natural anxiety to do all that can be done to make a young fruit or ornamental tree live and flourish. By this anxiety many people are influenced to place the roots deep, and to make a hollow or cup of earth around the trunk, thinking thus to give the roots greater protection and abundant moisture. Perhaps the particular objects they have in view are thus accomplished. But they, by this course, place the roots where they are too cold, and cannot perform their proper offices. The most experienced nursery men in this vicinity inform us that the lateral or horizontal roots should be placed about on a level with the surface of the ground; and that the other roots should be allowed to take the same relative position in the ground that they occupied before the tree was taken up. After the tree has been properly placed, earth up over the roots, letting the ground slope from the trunk. It is a good course to dig a large and deep hole, and to fill it up by replacing the earth, and putting in other earth more fertile. Small stones in the bottom of the holes have been found eminently serviceable to the growth and health of trees. Orchards have flourished well where the trees have been placed upon the surface of the ground without digging, and then a load of soil put upon each tree. Avoid getting them much below the surface of the surrounding soil. N. E. Farmer.

* For an exact account of this and other Delaware nations, see Gallatin's "Synopsis of the Indian Tribes," a work of extraordinary ability, contained in *Transactions of American Antiquarian Society*, vol. ii. p. 44, &c.

DESCRIPTION OF AMERICAN PATENTS

Granted from June 7th to July 8th, 1841.

Improvement in the manner of bracing the Arms of Paddle and Water Wheels. By WILLIAM F. JULIAN, Hartsville, Ind. June 7th.

CLAIM.—What I claim therein, and desire to secure by letters patent, is the within described manner of inserting and of drawing up the braces by means of brace bolts, attached at their inner ends to the circular plate which receives the end of the arms, said bolts being furnished with screw nuts, which are to bear against the middles of said braces, as described and represented; the braces being inserted and retained in place by means of short tenons, and left free to slide within the arms, as set forth. I also claim, in combination with the foregoing mode of bracing by means of the brace bolts, the employment of the wedges between the inner ends of the arms.

Improvement in the manner of constructing the Tooth Extractor. By MOSES J. HILL, Bloomfield, Ind. June 7th.

CLAIM.—What I claim therein, and desire to secure by letters patent, is the combining of a friction roller with the bolster of the ordinary key for extracting teeth, in such a manner as that said friction roller shall constitute the bearing part of the bolster in the operation of extracting a tooth, as herein set forth.

Improved Springs for Railroad Cars. By FOWLER M. RAY, Catskill, N. Y. Patented Nov. 3, 1838; Reïssued Sept. 25, 1840; and Reïssued June 8th, 1841.

CLAIM.—What I claim therein as constituting my invention, and desire to secure by letters patent, is the manner in which I construct, arrange and combine the respective leaves of which they are composed, as set forth, so that when lightly loaded, such of said leaves which constitute the lower portion of the spring shall not touch each other towards their outer ends, whilst they shall be brought into complete contact when heavily loaded; the extent of such contact being regularly proportioned to the load.

And I also claim the forming the upper portion of the spring, consisting of the leaf or leaves C′ C′, in the manner as that the points of bearing, towards their ends, shall approach each other, where they are in contact with the side rail A A as the load is increased, whilst the elastic force of their ends between these points of bearing, and their outer ends where they are held by the bolts, or pockets, is still rendered effective.

Improvement in the Sawmill. By JAMES B. LOWRY, of Northeast township, Pa. and PHILANDER EGGLESTON, Mayville, N. Y. June 11th.

CLAIM.—What we claim as our invention, and which we desire to secure by letters patent, is, the combination of the slide E, and stirrup S′ by which the chain and saw *a* are united, as herein set forth.

Manner of constructing an instrument for Fastening Doors on the inside, denominated the "Traveler's Security." By BENJAMIN H. GREEN, Princeton, N. J. June 11th.

CLAIM.—What I claim therein, and desire to secure by letters patent, is the manner of constructing the "Traveler's Security" by combining the two claw pieces with an intermediate screw, furnished with a thumb piece for turning the same, and otherwise adapted to its intended use, in the manner set forth.

Improvement in the manner of constructing the Beehive. By JAMES LE PATOUREL, Chandlersville, Ohio. June 11th.

CLAIM.—What I claim as my invention, and which I desire to secure by letters patent, is the manner in which the glass bowls or hives are combined with and adapted to the apertures in the cover, by being formed with hollow stems, as set forth. I also claim the furnace, constructed and combined with the hive, as set forth.

Improvements in Door Locks and Latches. By GEORGE W. WILSON, Nashua, N. H. June 11th.

CLAIM.—I claim a weighted or heavy tumbler, whether the same be arranged horizontally or vertically, constructed and disconnected from the latch substantially as described, and so operating as to cause the tumbler and knob to return to a stationary position by the gravitating power of the former, and thereby, whenever the door is closed, permit the latch to recede and advance independently of said tumbler and knob; and I also claim the combination of said tumbler with the gravitating latch, as herein above set forth.

I claim combining with the main bolt of the lock, another bolt, to be operated by an extra key, the whole being constructed and arranged substantially in manner and for the purposes above set forth.

I claim constructing the holding lever of the main bolt, as represented in fig. 3 of plate, and as herein before described, so as to render certain the fall of said holding lever by the withdrawal of the key from the lock.

I claim the peculiar apparatus for setting the alarm, as represented in plate iv, consisting of the slide and spring catch to be used in connection with the extra bolt, arranged and to operate substantially as above described.

Improvement in the manner of constructing a Horse Power for driving Machinery. By SAMUEL H. LITTLE, Gettysburg, Pa. June 11th.

CLAIM.—What I claim therein, and desire to secure by letters patent, is the manner in which I have arranged and combined together the cross or troughs for receiving the sweeps or levers, the arms and rim of the driving wheel A, and the friction rollers and their bearings, so that they may be shifted from the position which they are represented as occupying in fig. 1, and the respective parts thereof, so far as they are required, be transferred, in the manner herein set forth, so as to apply the motive power to the shafts E′ or H, in the manner and for the purpose fully set forth and described in the foregoing specification.

I claim the manner of constructing and arranging the shaft E′, with

its appendages, so as to adapt it to take the place of the shaft E, the weight and stress from the sweeps, the shaft, and the wheel thereon, being borne by the aid of the friction rollers on the part T′ of the standard N.

Improvement in the manner of arranging the low-pressure or condensing Steam-Engine so as to adapt its parts to be used by Vessels for Ocean service. By CHARLES W. COPELAND, New-York. June 11th.

CLAIM.—What I claim as new and as constituting my invention, is, first, the placing the cylinder in an oblique direction, with its lower end near to the bottom of the vessel, and allowing it to stand at such angle as is required for the connecting of its piston rod with the crank, on the shaft of the paddle-wheels, in combination with the condensers, channel plate, and air-pump, arranged and located as above described.

I do not claim the mere placing of the cylinder of the steam-engine obliquely, as this has been done for other purposes; but as I produce a new and useful effect by so placing the steam cylinder and its appendages in the combination above claimed, on board of vessels for navigating the ocean, I limit my claim to the so placing them under said combination as to attain the objects herein fully made known.

Secondly, I claim the manner of arranging and working the steam and the exhaust valves, as set forth, the same being effected by a direct action, that is to say, without the employment of the lifting rods and lifters usually required for that purpose.

Thirdly, I claim the manner of combining and arranging the condensing apparatus, the air-pump being placed at the same angle, or nearly so, with the cylinder, and attached by its lower end to the channel plate, the delivery valve being also placed on the upper part of said plate; the combination intended to be claimed under this last head consisting in the arranging of the several parts enumerated, that is to say, the air-pump, the channel plate, and the relieving valve, substantially in the way herein described and represented.

Improvement in the Fulling Mill. By SIDNEY E. COLEMAN, West Haven, Vt. June 11th.

CLAIM.—Having thus described my improvements, I shall claim as my invention, fulling cloths by means of revolving rollers or cylinders, (which may be plain or fluted) having different and proportionate motions, said cylinders being arranged in a box or casing, and operating substantially as herein above specified and described.

Improvement in the construction of Lamps. By CHRISTIAN and CHARLES RICHMAN, Philadelphia, Pa. June 11th.

CLAIM.—What we claim as our invention and desire to secure by letters patent, is the manner in which we have combined the wick tube E, with the runner D, and internal cylinder F; which is to say, we claim constructing the runner D with a spiral, as set forth, in combination with the internal cylinder F, having a vertical groove, and the wick tube E, arranged between them, by the combined action of which re-

volving spiral and stationary groove the wick tube and wick are raised without being turned, as in the ordinary astral lamps.

We also claim the manner in which we have combined the clasps H H with the tube E, forming it into two parts, and connecting them by hinges to the bottom of the tube, as set forth.

Lastly, we claim the employment of a conical glass button, in lamps for burning camphine and other oils.

Improvement in Sawmills. By William Bryant, Nashville, Tenn. June 11th.

Claim—What I claim as my invention, and desire to secure by letters patent, is the placing the guides which direct the saw at such an angle with the log or timber to be sawed, that the shavings, in being cut, are peeled or raised and carried forward by the teeth of the saw, in the lengthwise direction of the timber sawed.

Improvement in the manner of constructing the Rotary Steam-Engine. By Heman Smith, Sunbury, Delaware co. Ohio. June 11th.

Claim.—What I claim as my invention, and which I desire to secure by letters patent, is the peculiar form and construction of the double piston K, moving over the shaft D, in combination with the semicircular cam H, outside the steam chamber, as described, for changing the position of the pistons as the wheel revolves.

Improved apparatus for and mode of feeding Silkworms. By Edmund Morris, Burlington, N. J. June 16th.

Claim.—What I claim and desire to be secured by letters patent, are as follow :—

I claim the manner of constructing the within described apparatus or frame for feeding silkworms; that is to say, I claim the combining together of a series of feeding frames and of roofs, by sliding the end pieces of the same, extended out for that purpose, into grooves made in uprights, which may extend from the floor to the ceiling of the room, said feeding frames and roofs having such uprights at their backs only, and forming a continuous and unobstructed range in front of them along the whole or any desired portion of the apartment, without the intervention of uprights or supports of any kind, so as to admit of the operations of feeding and cleaning being carried on with perfect facility; the respective parts being arranged and combined substantially as herein set forth.

I claim the method of cleaning the worms, when necessary, the employment of the cleaning fork herein described, by which I lift up at once the entire surface on which the worms may be feeding, so as to clean them without waiting, as the practice has been, for the worms themselves to mount up into fresh foliage, and so as to allow the mass of stems and foliage to be promptly removed.

I claim the within described manner of forming the portable straw spinning roof, in which the worms are to form their cocoons, and by the portability of which I am enabled to identify the age, from the spinning, of any number of cocoons, the gathering of which is thereby

greatly facilitated, while the value is not endangered by being kept too long ungathered; the said spinning roof serving the double purpose of catching the litter from above, as it falls from the frame, and of affording a suitable place for the worms to spin in as they rise from the frame below.

Improvement in the manner of constructing the Spark Arrester. By RICHARD FRENCH, Philadelphia, Pa. June 16th.

CLAIM.—What I claim therein, and desire to secure by letters patent, is the manner herein described of arranging and combining the hoops or bands of perforated sheet metal or of wire gauze, by uniting them at their upper and lower edges alternately, so as to produce continuous perforated surfaces of great extent, between which surfaces concentric circular spaces are left, when the instrument is made circular, as is usually done. I also claim the combining with the foregoing apparatus of perforated hoops, bands or plates, a disk or cap, as shown at D, interposed between the top of the chimney and said system of perforated hoops or bands, for the purpose herein set forth and made known.

Improvement in the construction of the Plough. By DAVID PROUTY, Boston, and JOHN MEARS, Dorchester, Mass. June 16th.

CLAIM.—We claim arranging or connecting the invertible nose and wing together by means of suitable grooves on the side of the former and the corresponding angular or wedge-shaped sides of the latter, fitting into the grooves as described; and we also claim imbedding the invertible wing and nose or point upon the mouldboard, and confining them in their positions by means of a cap having projections and grooves corresponding with those of the said invertible parts, the cap being rabbeted to the ploughshare, so as to have its upper face a continuation of the curved surface of the same; the whole being confined together by a bolt or bolts and nuts, substantially as herein before described.

Improvement in the Grates of Sawgins for ginning Cotton. By ALBERT WASHBURN, Bridgewater, Mass. June 16th.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is the application of the aforenamed metallic substance of glass, or hard wood, or horn, or other similar substance, by the groove into the gin grate, where the teeth of the saw pass, which substance is removable at pleasure when impaired by friction, and supplied by a new one, whereby there is no necessity of removing the gin grate from the machine.

Improvement in the Machine for cutting Paper and trimming Books. By FREDERIC J. AUSTIN, New-York. June 16th. [Antedated December 16th, 1840.]

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is the peculiar mechanical combination used to give a lateral or sliding motion to the knife, which consists of the inclines or cams formed on the frame F, working on the cams *g g*, the connecting rods P P, and the frame, for the purpose and in the manner specified. Also, I claim

the mechanical construction of the press as arranged and combined with the parts for cutting, thereby forming an entire machine for the purpose described.

Improvement in the manner of making the Slides of Extension Tables. By Charles F. Hobe, New-York. June 22d.

Claim.—I am aware that the simple substitution of metal for wood, in the construction of these slides, will not afford a good claim for a patent, and therefore I do not claim such substitution merely in the manufacture of slides for extension tables; but what I do claim as my invention, and desire to secure by letters patent, is the providing each half slide with a slotted metal plate overlying a groove (in one or both faces) and fitting, either or both faces, with a double hook or ⊥ formed piece, so placed that the hook or T part on each half slide shall fit into and slide in the slotted plate and groove of the other half slide, and be secured in place by the piece X, and the combination of these parts, as substitutes for the wooden dovetail tongues and grooves heretofore in use, the whole being constructed and operating substantially as herein described.

Improvement in Compounds for Coating Metallic Surfaces to prevent oxidation. By Arthur Wall, Shadwell, Great Britain. June 22d.

Claim.—Now I do not claim as any part of my said invention, any of the separate processes, or the use of any vessel or furnaces; but what I claim as my invention, and desire to secure by letters patent, is the composition prepared as above described, for the prevention of corrosion in metals and for other purposes.

Improvement in the Machine for Washing Clothes. By Horatio N. Walter, Norwich, N. Y. June 22d.

Claim.—What I claim therein, and desire to secure by letters patent, is the manner in which I have constructed the fluted roller frame, and combined the same with the trough or cistern, as herein set forth; that is to say, I claim the arranging of the fluted roller, so that its gudgeons shall be received in sliding rods which are acted upon by spiral springs contained in two headblocks, which headblocks are connected together by a cap or covering which incloses the fluted roller, the whole being constructed substantially in the manner herein described. I claim also the combining of the said fluted roller frame with the cistern, by means of ledges attached to said cistern, and received within grooves on the headblocks, said grooves being furnished with friction rollers on their lower sides, and the roller frame being made to work back and forth horizontally upon a horizontal washboard, for the purpose and in the manner herein set forth.

Improvement in the construction of Water Wheels. By Nelson Johnson, Triangle, N. Y. June 22d.

Claim.—What I claim as my invention, and which I desire to secure by letters patent, is the manner in which I have combined the buckets C, with the inner bell-shaped rim A, and outer conical rim D, by form-

ing the scollops S, in the upper edge of said outer rim D, *i. e.* where the water enters, instead of in the lower edge of said rim where it discharges, as in my original improvement, and combining one edge of the buckets with the scollops thus arranged, and the other with the inner bell-shaped rim, as set forth.

Improvement in Machines for Setting Type. By JAMES HADDEN YOUNG, a subject of the Queen of Great Britain, and ADRIEN DELCAMBRE, a subject of the King of France. June 22d.

CLAIM.—We hereby declare the incline plane, the pushing frame, the covering plate, our new composing box, and the movements connected with the said box, to constitute our said invention, for which we claim to maintain exclusive right and privilege by means of letters patent.

Improvement in Lamps for burning Lard and other concrete substances. By EDWARD T. WILLIAMS and LATHAM T. TEW, Newport, R. I. June 26th.

CLAIM.—We shall claim the method of feeding the same or elevating the lard into the reservoir which contains the wick, by means of a movable piston inserted in the tube or neck, and operated by means of two long screws arranged in said tube, and adapted to work in corresponding screws formed through the piston, and revolved by the geared pinions, toothed wheel and key, the whole being constructed and arranged as herein above set forth.

Improvement in the construction of apparatus for arresting and depositing Sparks in Locomotive Steam-Engines, &c. By LEONARD PHLEGER, Philadelphia, assignee of WILLIAM W. HUBBELL, Moyamensing, Pa. June 26th.

CLAIM.—What I claim as constituting my invention, and desire to secure by letters patent, is the manner in which I have arranged and combined the chimney, and the spark arrester, and depositor; the chimney not being surrounded in any part by the arrester, but the two being placed side by side, and communicating with each other at their upper ends; and the arrester and depositor consisting of an outer case, an inner perforated or wire-gauze cylinder or tube, with an imperforated part where the draught first strikes it, and having a receptacle for cinders and ashes at its lower end; the whole being constructed, arranged and combined substantially in the manner and for the purpose herein fully set forth and made known.

Improvement in the manner of constructing the apparatus for arresting Sparks and preventing their escape in Locomotives, &c. By LEONARD PHLEGER, Philadelphia, assignee of WM. W. HUBBELL, Moyamensing, Pa. June 26th.

CLAIM.—I hereby declare that I do not claim to be the first inventor of either of the separate parts thereof, taken individually; but I do claim to have so combined and arranged these parts as to have produced an instrument substantially new in its character and beneficial in its

effects; that is to say, I claim the surrounding of the chimney B B by the perforated metallic cylinder or cone D D, and the jacket or case C C, combining the parts together and inclosing them, in the manner herein set forth; the chimney being finished with a cover or shutter, and tubes or pipes of communication extending from said chimney into the space L L; and the other parts concerned in the action of the apparatus being arranged substantially in the manner and so as to produce the results herein set forth.

Improvement in Spark Retainers or Depositors for preventing the escape of Sparks and Dust in Locomotive Steam-Engines, &c. By LEONARD PHLEGER, Philadelphia, assignee of WM. W. HUBBELL, Moyamensing, Pa. June 26th.

CLAIM.—What I claim therein as new, and desire to secure by letters patent, is the particular manner in which I have combined and arranged the respective parts thereof, as herein set forth; that is to say, I claim in combination the perforated cylinder D D, and the perforated belt or zone E E, connected with each other by means of imperforated annular plate *d d*, the lower edge of F F being connected to the drum B B, as described and represented.

I also claim, in combination with each other, the so arranging of the inclined annular plate of metal *e e*, the tube I I′ the perforated diaphragm J, and the tube K, as to conduct and deposit the sparks in the receptacle H, whilst that portion of the draught which accompanied them and forced them down is allowed to escape into the chimney, in the manner set forth.

Improvement in Spark Arresters for Locomotive Steam-Engines, &c. denominated "the Horizontal Spark Arrester." LEONARD PHLEGER, Philadelphia, assignee of WM. W. HUBBELL, Moyamensing, Pa. June 26th.

CLAIM.—What I claim therein and desire to secure by letters patent, is the combining of the spark arrester, placed in a horizontal position, with a vertical chimney, substantially in the manner set forth, for the purpose of obtaining the necessary length of flue, and of perforated metallic surface, for the proper action of the instrument, whilst the vertical chimney itself may be so shut as to pass under the lowest bridges upon railroads.

Railroad Alarm Signals. By SAMUEL NICOLSON, Boston, Mass. June 26th.

CLAIM.—I claim as my invention and desire to secure by letters patent the method of communicating motion to the alarm by the passing of the wheels of the tender, &c. over the curved lever *b*, connected with the alarm, in the manner specified.

Improvement in the method of constructing Machines for Hulling Rice and other Grain. By WEBSTER HERRICK, Northampton, Mass. June 26th.

CLAIM.—What I claim therein, and desire to secure by letters patent, is the employment of two disks, covered with pointed wires or with

stout card-teeth, one of which disks is made to revolve vertically within a drum, and is borne against a stationary disk similarly armed by means of a spiral spring pressing against its shaft, and regulated by a tempering screw, in the manner herein set forth and represented; and having combined therewith an iron centre plate or disk, provided with projecting ribs, for the purpose and in the manner described and represented at *a a* in fig. 3.

Improvement in Metallic Screws. By JOHN LUTHER, Warren, R. I. June 26th.

CLAIM.—What I claim as my invention, and which I desire to secure by letters patent, is making cast screws with iron, brass, or copper heads and shanks, whilst the body and thread are made of tin, lead, zinc, antimony, or any soft metal, or any of these combined.

Improvement in the construction of Wheels to be used upon Rail or other Roads or Ways. By HENRY DIRCK, Liverpool, Eng. June 26th.

CLAIM.—Having now fully explained the nature of the said invention, I desire it to be understood that I claim the combination of a metallic wheel, with a wooden-faced tire or tread, as before explained, without being confined to its precise mode of construction or putting together.

Improvement in the Floating Dry Dock. By JOHN THOMAS, New-York. June 26th.

CLAIM.—I am aware that end floats have been used in floating dry docks, for the double purpose of preserving the equilibrium of the dock and to assist the main floats in the body of the dock in raising the vessel and frame, the main floats being sunk by admitting water into them, and then by pumping it out, and therefore I do not claim merely the use of end floats, or dispensing with the inner or main floats, as heretofore known and used; but what I do claim as my invention, and desire to secure by letters patent, is the employment of movable end floats of sufficient capacity to raise the rope or vessel, when used without the inner or main floats, employed heretofore for the purpose and in the manner specified.

I also claim the combination of the right and left-handed screws, followers, tongue pieces, and movable floats, for the purpose and in the manner described.

Improvement in the manner of constructing a Horse Power for driving Machinery. By SAMUEL H. LITTLE, Gettysburg, Pa. Patented June 11th: Reïssued July 1st.

CLAIM.—What I claim therein, and desire to secure by letters patent, is the manner in which I have arranged and combined together the cross or troughs for receiving the sweeps or levers, the arms and rim of the driving wheel A, and the friction rollers and their bearing, so that they may be shifted from the position which they are represented as occupying in fig. 1; and the respective parts thereof, so far as they are required, be transferred in the manner herein set forth, so as to apply the motive power to the shafts E′ 1, or E, in the manner and for the purpose fully set forth and described in the foregoing specification.

I claim the manner of constructing and arranging the shaft E′ with its appendages, so as to adapt it to take the place of the shaft E, the weight and stress from the sweeps, the shaft, and the wheel thereon, being borne by the aid of the friction rollers on the part T of the standard N.

Improvement in the construction of Fire-Engines. By Jos. B. Babcock, Marietta, Ohio. July 1st.

Claim.—What I claim therein, and desire to secure by letters patent, is the manner in which I have arranged and combined two horizontal hollow pistons, with the horizontal cylinders affixed to the bottom of the cistern of a fire-engine, and also with the vibrating frame and segment wheels; the whole being constructed and operating as herein set forth. I do not claim either of these parts separately and individually; but I do claim so to have combined them as to produce an instrument new in its construction and useful in its operation.

Improvement in Beehives. By John M. Weeks, Salisbury, Vt. July 1.

Claim.—What I claim as my own invention, and not previously known in the beehive, is the mode of regulating the ventilation of the hive by means of tubes lined with wire-gauze and having apertures to which the adjustable caps perforated with similar apertures are adapted, the whole being constructed in the manner herein set forth.

I claim also combining with the central box or hive, one or more collateral boxes, containing smaller hives, Nos. 2 and 4, as set forth, in combination with the mode of ascertaining and regulating the temperature of the hives by means of thermometrical and ventilating apparatus N and X, the whole being constructed and operating substantially in the manner described.

Improvement in the Horse Power for driving Machinery. By Thomas J. Wells, New-York. July 1st.

Claim.—I do not claim as my invention the mere substitution of band for cogged wheels in the construction of a horse power, nor do I claim simply placing the double wheels on the horse sweep or lever to travel around the main or stationary wheel, as this has been heretofore done with cog wheels having the axes of the traveling wheels within the periphery of the main wheel, the cogs of which were put on the inner periphery thereof; but what I do claim as my invention, and desire to secure by letters patent, is placing the traveling wheels on the sweep, without the periphery of the main or stationary wheel, in combination with the employment of bands, as herein arranged.

Improvement in Marvin's & Seely's Steam Boiler and Evaporator; patented 28th of August, 1840. By Oran W. Seely, New-York. July 1st.

Claim.—What I claim therein, and desire to secure by letters patent, is, first, the manner of forming the stay bolts in the respective cells, by means of cores sustained upon a grating of iron, constructed in the manner set forth, said cores having holes bored through them wherever stay bolts are required to cross the cells; the respective parts being

arranged in the manner and for the purpose herein set forth. And secondly, I claim the sustaining of the body of the boiler by means of iron bridge-pieces crossing from side to side, and bolted through the plates forming the upper part of the division between the cells, as above described. I also claim the use of such bridge pieces, in the same manner and for the same purpose, whether the body of said boiler be formed of cast-iron in one entire piece, or of sheet metal by riveting the same together in the ordinary way.

Improvement in the Canal Lock Gate. By ROBERT ENGLISH, Legro, Wabash county, Ind. July 1st.

CLAIM.—What I claim as my invention, and which I desire to secure by letters patent, is the arrangement of the vertically moving gates B C, and air float D, in combination with the chamber A, trunks T, and valves H, as a substitute for the common horizontal moving gates; said gates B C being opened and closed by the combined action of air and water, in the manner herein set forth, or any other substantially the same.

I also claim, in combination with the foregoing, the self-acting break-water P, as described.

Improvements in the method of securing the Scythe upon the Snath, and in fastening the Nib to the same. By SILAS LAMSON, Shelburne Falls, Mass. July 1st.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is:—

1. The mode of securing the blade to the snath, as described in sec. 1 of the specification, and represented in fig. 1 of the drawings; that is to say, by means of the saddle plate A, and shank E, in combination with the cam bolts *c c*, or the spring catch B, arranged as before described.

2. The mode described in sec. 2, and represented in fig. 2, that is to say, by slitting the heel end of the blade, and deviating a portion from a straight line, and turning the other portion at right angles to the blade, and securing said portions to the end of the snath by screws, one of which having a large flat head to lap over the blade and the shank placed in an oblong mortise in the turned-up end of the blade, to allow of its being regulated at pleasure.

3. The mode described in sec. 3, and represented in fig. 3, that is to say, by rendering the heel end of the blade concave, to fit the convex end of the snath, and turning a portion over the back of the snath, and a portion at right angles against the front of it, and securing the blade by screw bolts placed in oblong slots, by which the blade can be set at pleasure, as described.

4. The mode described in sec. 5, and represented in fig. 7, by which the blade can be adjusted easily without removing the screws from the snath, by simply loosening them and adjusting the blade on the shanks by means of the oblong slots.

5. The mode represented in fig. 6, that is to say, by forming the two ends of the bar which surrounds the snath into a shank, and perforating the same with oblong apertures, to admit wedges or keys, which pass through the nib and said apertures, for drawing the snath home to the nib, as described.

6. The mode represented in fig. 9, by means of the combination of the square snath S, saddle P, and bolt I, as described.

Improvement in the Endless-chain Horse Power for driving Machinery. By ALONZO WHEELER and WILLIAM C. WHEELER, Chatham, N. Y. July 8th.

CLAIM.—We are aware that endless chains for horse powers have been invented with plates jointed together, and having cogs projecting from their under side to act on a pinion, and therefore we do not claim this as our invention; but what we do claim, and desire to secure by letters patent, is providing the lower edge of the links of the chain to which the endless flooring is attached with cogs to work into pinions, as above described.

Machine for cutting Dovetails and Tenons. By THOMAS J. WELLS, New-York July 8th.

CLAIM.—The invention claimed and desired to be secured by letters patent, is the before described mode of cutting tenons, or dovetails, or other forms, by a similar simultaneous rotary motion of the circular plane, and substance on which the tenon, dovetail or other form is to be made, the cutting performed being on an increment tangential line to the circumference of the revolving circular plane, whilst the cut made forms the chord line of a segment on the piece of the circular rail cut away by the revolving cutters.

Improvement in the construction of the Smut Mill. By CHARLES D. CHILDS, York, N.Y. July 8th.

CLAIM.—What I claim is combining those two arrangements, in the manner set forth, the perforated case containing the beaters and fan being placed above that containing the hopper and runners, arranged in the manner described; the revolving runner being placed on the same shaft with the fan and beaters, and the bottom of the case containing the latter, provided with spouts for carrying off the dust, and apertures to admit air to the fan, all as set forth.

LIST OF ENGLISH PATENTS

GRANTED BETWEEN THE 26TH OF MAY AND THE 25TH OF JUNE, 1841.

George Bent Ollivant and Adam Howard, of Manchester, millwrights, for certain improvements in cylindrical printing machinery for printing calicoes and other fabrics, and in the apparatus connected therewith, which is also applicable to other useful purposes. June 5; six months.

John Mee, of Leicester, framesmith, for improvements in the manufacture of looped fabrics. June 5; six months.

William Hannis Taylor, of Lambeth, esquire, for certain improvements in propelling machinery. June 5; six months.

Joseph Gibbs, of the Oval, Kensington, civil engineer, for certain improvements in roads and railways, and in the means of propelling carriages thereon. June 5; six months.

Miles Berry, of Chancery-lane, patent agent, for certain improvements in machinery or apparatus for ruling paper. (A communication.) June 5; six months.

James Colley March, of Barnstaple, surgeon, for certain improved means of producing heat from the combustion of certain kinds of fuel. June 8; six months.

Henry Richardson Fanshaw, the younger, of Hatfield-street, Surrey, chemist, for improvements in curing hides and skins, and in tanning, washing and cleaning hides, skins and other matters. June 10; six months.

John George Bodmer, of Manchester, engineer, for certain improvements in machinery for propelling vessels on water, parts of which improvements apply also to steam-engines to be employed on land. Juue 10; six months.

Edward Hammond Bentall, of Heybridge, Essex, ironfounder, for certain improvements in ploughs. June 10; six months.

Robert Oram, of Salford, Lancaster, engineer, for certain improvements in hydraulic presses. June 12; six months.

James Wills Wayte, of the "Morning Advertiser" office, Fleet-street, engineer, for certain improvements in machinery or apparatus for letter-press printing. June 12; six months.

John Anthony Tielens, of Fenchurch-street, merchant, for improvements in machinery or apparatus for knitting. (A communication.) June 12; six months.

George Claudius Ash, of Broad-street, Golden-square, dentist, for improvements in apparatus for fastening candles in candlesticks. June 12; six months.

Edward Palmer, of Newgate-street, gentleman, for improvements in producing printing surfaces, and in the printing china, pottery ware, music, maps, and portraits. June 12; six months.

Ezekiel Jones, of Stockport, mechanic, for certain improvements in machinery for preparing, slubbing, roving, spinning and doubling cotton, silk, wool, worsted, flax, and other fibrous substances. June 12; six months.

Alexander Horatio Simpson, of New Palace-yard, Westminster, gentleman, Peter Hunter Irvin, and Thomas Eugene Irvin, both of Charles-street, Hatton-garden, philosophical instrument makers, for an improved mode of producing light, and of manufacturing apparatus for the diffusion of light. June 17; six months.

Thomas Walker, of North Shields, engineer, for improvements in steam-engines. June 18; six months.

William Petrie, of Croydon, gentleman, for improvements in obtaining mechanical power, which are also applicable for obtaining rapid motion. June 19; six months.

John Haughton, of Liverpool, clerk, M. A., for improvements in the method of affixing certain labels. June 19; six months.

James Henry Shaw, of Charlotte-street, Blackfriars, jeweler, for improvements in setting wheat and other seeds. June 19; six months.

Sir Samuel Brown, knight, of Netherbyers-house, Ayton, Berwick, for improvements in the means of drawing or moving carriages and other machines along inclined planes, railways, and other roads, and for drawing or propelling vessels in canals, rivers, and other navigable waters. June 19; six months.

John George Truscott Campbell, of Lambeth-hill, Upper Thames-street, grocer, for improvements in propelling vessels. June 19; six months.

Joseph Gauci, of North-crescent, Bedford-square, artist, and Alexander Bain, of Wigmore-street, Cavendish-square, mechanist, for improvements in inkstands and inkholders. June 21; six months.

Miles Berry, of Chancery-lane, patent agent, for a new or improved engine, machine or apparatus for producing or obtaining motive power by means of gases or vapors produced by combustion. June 23; six months.

William Walker, the elder, of Standish-street, Liverpool, watch-finisher, for an improvement or improvements in the manufacture of the detached lever watch. June 23; six months.

George Thomas Day, of Upper Belgrave-place, Pimlico, gentleman, for an improved apparatus for creating draft applicable to chimneys and other purposes. June 23; six months.

John Henry Le Keux, of Southampton-street, Pentonville, for an improvement in line engraving, and in producing impressions therefrom. June 23; two months.

John Goodwin, of Cumberland-street, Hackney-road, pianoforte maker, for an improved construction of pianofortes of certain descriptions. June 23; two months.

James Sidebottom, of Waterside, Derby, manufacturer, for certain improvements in machinery for apparatus. June 23.

William Chesterman, of Burford, Oxford, gentleman, for improvements in filtering liquids. June 23; six months.

Robert Stephenson, of Great George-street, Westminster, civil engineer, for certain improvements in the arrangement and combination of the parts of steam engines of the sort commonly called locomotive engines. June 23; six months.

John Lee Stevens, of King Edward-street, Southwark, general agent, and John King, of College Hill, London, printer, for certain improvements in candle-sticks and other candle-holders. June 25; six months.

LIST OF PATENTS GRANTED FOR SCOTLAND FROM THE 22D OF MAY TO THE 22D OF JUNE, 1841.

Edward Henshall, of Huddersfield, York, carpet manufacturer and merchant, for certain improvements in making, manufacturing or producing carpets and hearth rugs. Sealed May 24, 1841.

William Petrie, of Croydon, Surrey, gentleman, for a mode of obtaining a motive power by means of voltaic electricity applicable to engines, and other cases where a moving power is required. May 24.

Moses Poole, of Lincoln's Inn, Middlesex, gentleman, for improvements in the manufacture of fabrics by felting. May 24. (Being a communication from abroad.)

William Joest, of Ludgate-hill, London, merchant, for improvements in propelling vessels. May 24. (Being a communication from abroad.)

Andrew McNab, of Paisley, Renfrew, North Britain, engineer, for certain improvements in the manufacture of bricks. May 26.

Christopher Nickels, of York-road, Lambeth, Surrey, gentleman, for improvements in the manufacture of mattresses, cushions, paddings or stuffings, and in carpets, rugs and other napped fabrics. June 1. (Being partly a communication from abroad, and partly an invention of his own.)

John Clay, of Cottingham, York, gentleman, and Frederic Rosenberg, of Sculcoates, York, gentleman, for improvements in arranging and setting up types for printing. June 3.

Sir Samuel Brown, knight of the Royal Hanoverian Guelphic Order, Commander in Her Majesty's Navy, of Netherbyres-house, Ayton, Berwick, for improvements in the means of drawing or moving carriages and other machines along inclined planes, railways and other roads, and for drawing or propelling vessels in canals, rivers and other navigable waters. June 4.

William Brockedon, esquire, of Queen-square, Middlesex, for a composition of knowu materials, forming a substitute for corks and bungs. June 9.

John Lambert, of No. 12 Coventry-street, in the parish of St. James, Westminster, gentleman, for certain improvements in the manufacture of soap. June 10. (Being a communication from abroad.)

Richard Laming, of Gower-street, Bedford-square, Middlesex, surgeon, for improvements in the production of carbonate of ammonia. June 14.

Joshua Field, of Lambeth, Surrey, engineer, for an improved mode of effecting the operation of connecting and disconnecting from steam-engines the paddle-wheels used for steam navigation. June 16.

Andrew McNab, of Paisley, Renfrew, North Britain, engineer, for an improvement or improvements in the making or construction of meters or apparatus for measuring water or other fluids. June 21.

Joseph Maudslay, of Lambeth, Surrey, engineer, for improvements in the arrangement and combination of certain parts of steam-engines to be used in steam navigation. June 21.

John Condie, of Blair Iron Works, Ayr, in the kingdom of Scotland, for improvements in applying springs to locomotive and railway and other carriages. June 22.

George Richard Elkington and Henry Elkington, of Birmingham, Warwick, for improvements in coating, covering, or plating certain metals. June 22.

Moses Poole, of Lincoln's Inn, Middlesex, gentleman, for improvements in producing and applying heat. June 22. (Being a communication from abroad.)

LIST OF IRISH PATENTS GRANTED FOR JUNE, 1841.

J. J. Cordes and E. Locke, for a new rotary engine.

J. Johnson, for certain improvements in machinery for the manufacture of frame-knitting, commonly called hosiery, and for certain improvements in such framework knitting and hosiery.

G. D. Patterson, for the following improvements in curvilinear turning, that is to say, a rest adapted for cutting out wooden bowls, and a self-acting slide-rest for other kinds of curvilinear turning.

H. S. Pattinson, for improvements in the manufacture of white lead.

John Rand, for improvements in preserving paints and other fluids.

N. Defris, for improvements in gas-meters.